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January 16, 1998

Mr. Jonathan Adenuga
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Waste, Pesticides & Toxics Division
U.S. EPA – REGION 5


Dear Mr. Adenuga:

SUBMISSION OF REVISED FINAL RFI REPORT REVISION 2
FEDERATED METALS CORPORATION, HAMMOND, INDIANA
IND 005 444 104

On November 7, 1997, Bridgeview Management Company, Inc. received notice from the United States Environmental Protection Agency (U.S. EPA) that the July 1997 RCRA Facility Investigation (RFI) Report (Revision 1) for the above-referenced site was not approved. This notice provided specific comments and requested modifications to the RFI report.

The attachment to this letter, prepared by Geraghty & Miller, Inc., presents U.S. EPA comments (italicized) followed by our responses. In addition to the attachment, enclosed are three copies of the RCRA Facility Investigation final report (Revision 2). This report addresses your comments as outlined in the Attachment. Please replace all text in Volume I of the July RFI (Revision 1) with the Revision 2 text. In addition, you will find enclosed (three each) binder title pages for Volumes I, II, III and IV. Please replace the July Revision 1 binder pages with the enclosed Revision 2 pages. Also, Volume V, Appendix T, which contains the "Conceptual Site Model and Alternate Concentration Limits" report is deleted from the final RFI Revision 2.

Please contact me if you have any questions or concerns. Thank you for your attention to this matter.

Very Truly Yours,

Barry C. Harris
President
Project Manager

BCH/JY

Attachment
Enclosures

c: MOVarner
AMoore
MRThorp
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U.S. EPA – REGION 5

**FEDERATED METALS RESPONSE**

**TO THE**

**USEPA'S NOV. 1997 COMMENTS**

**ON THE**

**JULY 1997 FINAL RCRA FACILITY INVESTIGATION REPORT**

**USEPA Comment:**
**Section 4.1.2.3.3 to 4.1.2.3.4 SMWU's #4, #5, & #7 Soil Sampling**

*In response to U. S. EPA's comment regarding the barrier capabilities of the Globe warehouse, the text simply states that contaminants in SMWUs #6 and #7 may have originated at these SMWUs prior to the construction of the warehouse and that the source of metals in WM-10 and WM-11 is most likely to be from one or all SMWUs onsite including SMWUs #1 and #2. We agree that MW-8 is cross-gradient to SMWU #4, however, after considering FMC's generous interpretation of the likelihood of events that may have occurred at SMWUs #6 and #7 and MW-10 and MW-11, we continue to maintain, based on groundwater and soils data and the location of these SMWUs, that the Globe warehouse has not prevented contaminants migration. Irrespective of whether comtaminants originated in these SMWUs prior to the construction of the warehouse, there is no evidence to support your claim. Considering the proximity of these SMWUs to these monitoring wells, distance of contaminant travel and metal concentrations in the soils, it appears that SWMU #6 which is also located within the warehouse is the most likely source of zinc in MW-11. Assuming that the source of metals is from all onsite SWMUs, the warehouse has not prevented metals from migrating from SWMU #4 and #5 to MW-10 and MW-11.*

*Also, we agree that ACLs may be used as a guide in this circumstance, however, FMC failed to consider other constituents such as zinc and copper detected in SWMUs #4 and #6. Therefore, in addition to SWMU #5, already proposed to be addressed in the CMS, SWMUs #4, #6 and #7 must be included in the list of SWMUs to be addressed in the CMS.*

**Federated Metals Response:**

Federated Metals has decided to remove the Alternate Concentration Limit (ACL) discussion from the RFI report and address the establishment of clean up levels in the Corrective Measures Study (CMS) considering the Indiana Department of Environmental Management's (IDEM's) draft Risk-Integrated System for Cleanup (RISC) as suggested in the USEPA's November 4, 1997 letter transmitting its comments on the July 1997 Final RFI Report. In addition, none of the SWMUs have been eliminated from the CMS process, and as such, Federated Metals will be addressing each of the SWMUs at the site in the CMS.

**USEPA Comment:**
**Section 4.1.3.1 VOCS Summary for Soil**

*According to the draft report, section 4.1.2.5.4, ACLs were not calculated for the SWMUs #9 and #10 because the collected soil samples were saturated. However, the text in this section concludes that no VOCs were detected in soil samples at SWMUs #1, #9 and #10 exceeded ACLs. Not only must this discrepancy be resolved, SWMUs #9 and #10, which are the probable sources of the TCE and PCE detected in soils and groundwater, should also be addressed in the CMS.*

**Federated Metals Response:**

Federated Metals has decided to remove the Alternate Concentration Limit (ACL) discussion from the RFI report and address the establishment of clean up levels in the Corrective Measures Study (CMS) considering the Indiana Department of Environmental Management's (IDEM's) draft Risk-Integrated System for Cleanup (RISC) as suggested in the USEPA's November 4, 1997 letter transmitting its comments on the July 1997 Final RFI Report. In addition, none of the SWMUs have been eliminated from the CMS process, and as such, Federated Metals will be addressing each of the SWMUs at the site in the CMS.

**USEPA Comment:**
**Section 4.2.4.3 & 4.2.7.4 Total Metals & Dissolved Metals Analysis**

*The addition of the last paragraph in section 4.2.7.4 is acceptable and should be published in the final RFI report. As was indicated in U. S. EPA's May 1997 comment regarding total metals results, MCL's are based upon unfiltered groundwater data. The total metal results must now be used in the evaluation of remedial alternatives to be considered in the CMS. To the extent that any impact on the selected remedial alternative is discernible from the new data collected from all onsite monitoring wells using the low-flow sampling methodology, U. S. EPA would reconsider this new information.*

**Federated Metals Response:**

Federated Metals has decided to remove the Alternate Concentration Limit (ACL) discussion from the RFI report and address the establishment of clean up levels in the Corrective Measures Study (CMS) considering the Indiana Department of Environmental Management's (IDEM's) draft Risk-Integrated System for Cleanup (RISC) as suggested in the USEPA's November 4, 1997 letter transmitting its comments on the July 1997 Final RFI Report. In addition, none of the SWMUs have been eliminated from the CMS process, and as such, Federated Metals will be addressing each of the SWMUs at the site in the CMS.

**USEPA Comment:**
**Section 4.2.9 Summary of Groundwater Sampling for Release Characterization**

*Although, the discrepancy regarding whether VOCs detected in soils underneath SWMUs #9 & #10 exceeded ACLs is yet to be resolved, groundwater monitoring data indicate that MW-12 downgradient of SWMUs #9 and #10 is contaminated with TCE. The text proposes only performance monitoring downgradient of monitoring wells MW-7, 8, 9, 12, 13 and 15. The text should discuss source removal at SWMUs #9 & #10 or the type of performance monitoring scheme that would be employed to assess the migration of TCE and PCE, if any, and the corrective action to be taken.*

**Federated Metals Response:**

Federated Metals has removed references to performance monitoring and plans to evaluate potential corrective measures for SWMUs in the CMS considering the IDEM's RISC program.

**USEPA Comment:**
**Section 4.2.9 Summary of Groundwater Sampling for Release Characterization**

*According to the text, pentachlorophenol detected in MW-6 and MW-8 could have originated from an off-site source. U. S. EPA does not have enough information to support this claim and is unwilling to eliminate this constituent from further consideration. We propose that this compound be further evaluated through future groundwater monitoring . Therefore, pentachlorophenol should be added to the list of constituents to be analyzed during groundwater monitoring all onsite monitoring wells.*

**Federated Metals Response:**

Federated Metals noted that pentachlorohenol was detected in a sample from a background well and that there were no known on-site uses of pentachlorophenol.

Pentachlorophenol will be added to the list of constituents to be analyzed for during future groundwater monitoring of onsite wells as required by the USEPA.

**USEPA Comment:**
**Section 4.2.9 Summary of Groundwater Sampling for Release Characterization**

*As was indicated in U. S. EPA's May 1997 comments, we intend to re-evaluate the results of the entire voluntary off-site monitoring program that has been implemented at the FMC facility after the current RFI data have been fully evaluated, including the preliminary groundwater monitoring data collected from all off-site temporary wells. At this time the U. S. EPA does not have enough information to support FMC's contention that the arsenic concentration detected in the deep aquifer north of the facility is indicative of background concentration. In addition, no formal approval of future off-site sampling methodologies have been made or implied through future approval of the RFI report.*

*We also do not agree to the proposed monitoring of a minimum of one off-site well cluster in lieu of the re-evaluation of the voluntary off-site monitoring program. However, U. S. EPA is willing to establish a framework for the discussion of future off-site investigations by suggesting certain amendments of FMC's proposed off-site groundwater investigations. These suggested amendments follow the discussion below:*

*Based on our review of your May 15 and April 17, 1997 letters to IDEM in which you proposed additional off-site groundwater investigations and a cursory review of the groundwater data submitted in conjunction with the RFI report, we have identified some shortcomings.*

*According to the above letter, one off-site well cluster will be located adjacent to TSP-8. You also proposed that Transect #2 and #1 or Transect #3 will be sampled if arsenic and fluoride concentrations are detected above background. The proposed one well cluster is also located on Transect #3, a distance of 2800 feet from the facility boundary and approximately 1600 feet from the inferred delineation of the extent of arsenic on Figure 4-14. We believe that this distance does not provide for adequate investigation. We suggest that a determination of a true representation of the leading edge of the contaminant plume directly north of 119$^{th}$ Street would be more appropriate. Referring to Figure 4-14 of Volume 1 of the draft RFI report, two cluster wells should be installed directly north of 119$^{th}$ Street, one cluster between La Porte and Central avenues and another cluster between Sheridan and La Porte avenues. Finally, FMC should provide some explanation as to how the data collected from these well clusters would be used.*

**Federated Metals Response:**

Federated Metals encourages the USEPA to review the entire voluntary off-site monitoring program as we believe it clearly established the extent of the plume. The USEPA's comments have been considered in the development of the revised Interim Status Groundwater Assessment Plan currently being implemented.

**USEPA Comment:**
**Section 4.3.3.4.1 Comparison of Analytical Results for Select Metals to Indiana Water Quality Criteria**

*The text indicates that Indiana does not have acute or chronic aquatic criteria for arsenic, barium, mercury, and fluoride. In the absence of Indiana surface water criteria for these metals, Appendix T of the RFI Report considers National Ambient Water Quality Criteria (NAWQC) to establish a benchmark value for mercury. Additional information is available in the most recent NAWQC (1996) to also establish a benchmark for arsenic. In the absence of NAWQC values for Barium, the Great Lake Water Quality Initiative (GLWQI) value identified in Table 2 of U. S. EPA, 1996c (see Appendix T, Section 10.0, References) is acceptable. We recommend that, in the absence of Indiana surface water criteria, the 1996 NAWQC and, if necessary, the GLWQI values be used to evaluate the surface water data collected from Lake George.*

**Federated Metals Response:**

The USEPA's comments will be considered in the CMS considering the IDEM's RISC program.

**USEPA Comment:**
**Section 5.3 Para. 3, Surface Water**

*Although, this section was revised to address U. S. EPA's concerns regarding a conclusive statement pertaining to FMC's interpretation of the data collected in Lake George, the conclusion in the last paragraph is still somewhat misleading. The sentence in the last paragraph attempts to simplify the severity of the contamination in the adjacent lake sediment/surface water and only identifies Lake George as a pathway to potential receptors. The basis for identifying Lake George as a pathway to potential receptors is the potential risks posed by the nature and extent of contamination detected in this lake.*

*We also note several portions of the RFI report concluding that only the ACL for arsenic, cadmium and antimony were exceeded. This conclusion conveys to the reader that adjacent sediment/surface water of Lake George are not impacted. If so, and to avoid confusing the corrective action program with the regulatory requirements, ACL's are*

*concentration levels considered for remediation activities, but are not necessarily regulatory/concentration levels used to determine when impact to the environment has occurred. The assertion that ACL's for certain metals were not exceeded does not negate the fact that sediment/surface water in close proximity to the facility have been impacted. Therefore, the last sentence in paragraph one of page 5-5 of the draft RFI report should be replaced with the entire first paragraph beginning with "Based on the available analytical data ..." on page 13 of the FMC's June 30, 1997 letter/response.*

**Federated Metals Response:**

The text has been added as requested, exclusive of references to ACLs or risk, which will be addressed in the CMS.

**USEPA Comment:**
**Section 6.1.2 and 6.1.3 Safe Drinking Water MCL's & ACL's**

*As have been identified in this report, other than for the purpose of drinking water, lawn watering (Residential) was identified as a potential exposure pathway. According to the report also, both onsite and off-site groundwater monitoring results show exceedences of MCLs for lead, cadmium arsenic, fluoride and zinc. Based on the information provided, cleanup to MCLs standards may not, at this time, be appropriate for the onsite contaminated groundwater. However, it is unreasonable to consider deed restrictions on contaminated groundwater flowing toward residences located down gradient of the facility. Therefore, in order for U. S. EPA to consider ACLs for remediation of contaminated groundwater, FMC must consider some source removal. The onsite contaminated media (soils/SWMUs) can not continue to be a source of contamination to the groundwater. The direct relationship between contaminated media and groundwater can not be overemphasized. Therefore, the Final RFI report, must identify specific SWMUs/soil for removal in order to eliminate them as future potential sources of contamination to the groundwater.*

**Federated Metals Response:**

Federated Metals has decided to remove the Alternate Concentration Limit (ACL) discussion from the RFI report and address the establishment of clean up levels in the Corrective Measures Study (CMS) considering the Indiana Department of Environmental Management's (IDEM's) draft Risk-Integrated System for Cleanup (RISC) as suggested in the USEPA's November 4, 1997 letter transmitting its comments on the July 1997 Final RFI Report. In addition, none of the SWMUs have been eliminated from the CMS process, and as such, Federated Metals will be addressing each of the SWMUs at the site in the CMS.

**USEPA Comment:**
**Section 6.2.1 Soil**

*The text seems to imply the following: (a) The only SWMUs that need to be addressed in the CMS are SWMUs #1, #2 and #5; (b) That the CMS will likely consider deed restrictions to limit potential future exposure for SWMUs located within the manufacturing building; ( c) FMC may consider additional soil investigation after the demolition and removal of SWMU #8.*

*We agree that future use of a site may determine the appropriate cleanup standards for soils and that SWMU #1,#2 and #5 should be addressed in the CMS. However, SWMUs #3, #4, and #6 must also be included in the list of SWMUS to be addressed in the CMS.*

*Finally, the Final RFI report must include a sampling and analysis protocol for investigating the nature of the soils beneath SWMU #8 after the completion of the proposed demolition and removal of waste.*

**Federated Metals Response:**

Federated Metals has decided to remove the Alternate Concentration Limit (ACL) discussion from the RFI report and address the establishment of clean up levels in the Corrective Measures Study (CMS) considering the Indiana Department of Environmental Management's (IDEM's) draft Risk-Integrated System for Cleanup (RISC) as suggested in the USEPA's November 4, 1997 letter transmitting its comments on the July 1997 Final RFI Report. In addition, none of the SWMUs have been eliminated from the CMS process, and as such, Federated Metals will be addressing each of the SWMUs at the site in the CMS.

**FEDERATED METALS RESPONSE**

**TO THE**

**USEPA'S NOV. 1997 COMMENTS**

**ON THE**

**RFI SITE CONCEPTUAL MODEL AND ALTERNATE CONCENTRATION LIMITS**

**USEPA Comment:**
**Section 2.2 Potential Receptor Survey**

1. *Paragraph 2 on page 2-2 states that although the facility has dawn-to-dusk security and an 8-foot tall chain-link fence, there is evidence that trespassers frequently access contaminated areas. Moreover, access to contaminated sediments and surface waters of Lake George are not controlled by the facility. The risk assessment has accounted for an adolescent trespasser, which is more conservative than an adult due to a lower body weight and a ten year exposure period. However, the use of one visit per week during the summer as an exposure frequency may not be an accurate assumption since the trespasser may visit on weekends or multiple times during the week. The Conceptual Site Model and Alternate Concentration Limits document (CSM/ACL) should include a detailed description of historical trespasser activity and a justification for the adolescent trespasser exposure frequency for both on-site contamination and contamination in Lake George.*

**Federated Metals Response:**

Federated Metals has decided to remove the Alternate Concentration Limit (ACL) discussion from the RFI report and address the establishment of clean up levels in the Corrective Measures Study (CMS) considering the Indiana Department of Environmental Management's (IDEM's) draft Risk-Integrated System for Cleanup (RISC) as suggested in the USEPA's November 4, 1997 letter transmitting its comments on the July 1997 Final RFI Report.

**USEPA Comment:**

2. *Paragraph 1 on page 2-3 describes groundwater uses surrounding the facility. It is noted that there is a residence approximately 3,500 feet north of the site and that the residents there use the groundwater for external watering. The use of potentially impacted groundwater for watering lawns, washing cars, washing/watering pets could provide dermal exposure, and possible inhalation/ingestion exposure. The*

*CSM/ACL should provide additional information on the uses of groundwater north of the facility. In addition, further justification for exclusion of residents living north of the site in the current land use exposure scenarios must be provided, or these residents must be included in the exposure assessment.*

**Federated Metals Response:**

Federated Metals has decided to remove the Alternate Concentration Limit (ACL) discussion from the RFI report and address the establishment of clean up levels in the Corrective Measures Study (CMS) considering the Indiana Department of Environmental Management's (IDEM's) draft Risk-Integrated System for Cleanup (RISC) as suggested in the USEPA's November 4, 1997 letter transmitting its comments on the July 1997 Final RFI Report.

**USEPA Comment:**

3. *Explain why other sources of potential exposure are not addressed in the CSM. For instance, the Federated Metals site impacts local surface waters where recreational fishing may be practice. Although section 7.0, the Ecological Evaluation, discusses surface waters and the current site impact upon fish, the reason why fish ingestion is not considered for present and future residents is not properly discussed in the CSM. Also, the CSM mentions that use of groundwater in the area is limited, however, it does not specifically address whether there are any local agricultural areas where contaminated groundwater might be used for irrigation or livestock watering. In addition, the CSM must discuss whether there is any potential for indoor air pollution.*

**Federated Metals Response:**

Federated Metals has decided to remove the Alternate Concentration Limit (ACL) discussion from the RFI report and address the establishment of clean up levels in the Corrective Measures Study (CMS) considering the Indiana Department of Environmental Management's (IDEM's) draft Risk-Integrated System for Cleanup (RISC) as suggested in the USEPA's November 4, 1997 letter transmitting its comments on the July 1997 Final RFI Report.

**USEPA Comment:**
**<u>Section 4.0 Dose Response Assessment</u>**

4. The document should be revised to describe the method used to derive Cancer Slope Factors (CSF) for PAHs using the Benzo (a) pyrene CSF and relative potency factor for carcinogenic PAHs. The potency factors used should be provided so that their accuracy can be reviewed.

**Federated Metals Response:**

Federated Metals has decided to remove the Alternate Concentration Limit (ACL) discussion from the RFI report and address the establishment of clean up levels in the Corrective Measures Study (CMS) considering the Indiana Department of Environmental Management's (IDEM's) draft Risk-Integrated System for Cleanup (RISC) as suggested in the USEPA's November 4, 1997 letter transmitting its comments on the July 1997 Final RFI Report.

**USEPA Comment:**
**Section 5.2.4 Future Resident**

5. *Further Justification must be provided for eliminating future residential contact soils at the site, or include this exposure scenario in the risk assessment. No evidence has been provided that local zoning will ensure that the land will always remain industrial, nor are institutional controls described to support an assumption that the land would always remain industrial. EPA's Risk Assessment Guidance for Superfund Volume I – Human Health Evaluation Manual (Part A) (EPA 540/1-89-002, December 1989) states that residential land use is generally the most conservative choice for future land use will be residential, and include the scenario in the risk assessment.*

**Federated Metals Response:**

Federated Metals has decided to remove the Alternate Concentration Limit (ACL) discussion from the RFI report and address the establishment of clean up levels in the Corrective Measures Study (CMS) considering the Indiana Department of Environmental Management's (IDEM's) draft Risk-Integrated System for Cleanup (RISC) as suggested in the USEPA's November 4, 1997 letter transmitting its comments on the July 1997 Final RFI Report.

**USEPA Comment:**
**Section 6.0 Risk Characterization**

6. *Clarify how inhalation cancer risks are calculated for PAHs. Identify the data source for the inhalation CSF listed as 6.1 x $10^{-1}$ kg-day/mg for benzo (a) anthracene in the example calculation for Table 6-1. Note that Table 4-2 does not list an inhalation Cancer Slope Factor for any PAH. Revise the risk assessment to provide additional explanation on the procedures and data used to derive the PAH inhalation CSFs.*

**Federated Metals Response:**

Federated Metals has decided to remove the Alternate Concentration Limit (ACL) discussion from the RFI report and address the establishment of clean up levels in the Corrective Measures Study (CMS) considering the Indiana Department of Environmental Management's (IDEM's) draft Risk-Integrated System for Cleanup (RISC) as suggested in the USEPA's November 4, 1997 letter transmitting its comments on the July 1997 Final RFI Report.

**USEPA Comment:**
**Section 6.2 Carcinogens**

7. *Federated Metals must justify the use of a target cancer risk level of 1 x $10^{-5}$ in calculating ACLs. Both the Indiana Voluntary Remediation Program and U. S. EPA's proposed Subpart S corrective action rule (Vol. 61 Federal Register 19432 on 5/1/96, and Vol. 55 Federal Register 30798 on 7/27/90) indicate that a target cancer level of 1 x $10^{-6}$ should be used as the point of departure in assessing risks and developing cleanup standards. While the Indiana Department of Environmental Management (IDEM) allows for a 1 x $10^{-5}$ level to be used for industrial land uses, this guidance does not supersede U. S. EPA RCRA corrective action guidance. Moreover, Federated Metals has not adequately demonstrated that future residential uses of the property will never occur. In addition, the 1 x $10^{-5}$ level is also inappropriately used to derive ACLs for the adolescent trespasser, who contacts not only on-site contaminated soils but off-site contaminated sediments and surface waters in Lake George. The ACLs should be redeveloped for all media using a target cancer risk level of 1 x $10^{-6}$.*

**Federated Metals Response:**

Federated Metals has decided to remove the Alternate Concentration Limit (ACL) discussion from the RFI report and address the establishment of clean up levels in the Corrective Measures Study (CMS) considering the Indiana Department of Environmental Management's (IDEM's) draft Risk-Integrated System for Cleanup (RISC) as suggested in the USEPA's November 4, 1997 letter transmitting its comments on the July 1997 Final RFI Report.

**USEPA Comment**
**Table 4-5 Permeability Coefficients for Constituents of Concern**

8. *Identify the equation used to calculate the permeability coefficients for constituents of concern at the site. Discuss why the Bronaugh equation was selected, when U. S. EPA's Dermal Exposure Assessment: Principles and Applications guidance EPA/600/8-91/001B, January 1992) uses a different equation to predict permeability*

*coefficients. Identify the input parameters that were used to calculate the values shown in Table 4-5, so that they may be reviewed for concurrence.*

**Federated Metals Response:**

Federated Metals has decided to remove the Alternate Concentration Limit (ACL) discussion from the RFI report and address the establishment of clean up levels in the Corrective Measures Study (CMS) considering the Indiana Department of Environmental Management's (IDEM's) draft Risk-Integrated System for Cleanup (RISC) as suggested in the USEPA's November 4, 1997 letter transmitting its comments on the July 1997 Final RFI Report.

**USEPA Comment:**

9. *Justify the section of a 1.6 x $10^{-4}$ cm/hr assumed permeability coefficient for all inorganics. U. S. EPA's Dermal Exposure Assessment guidance, cited above, indicates that a default assumption of 1 x $10^{-3}$ cm/hr rate should be used for inorganic that have not been tested.*

**Federated Metals Response:**

Federated Metals has decided to remove the Alternate Concentration Limit (ACL) discussion from the RFI report and address the establishment of clean up levels in the Corrective Measures Study (CMS) considering the Indiana Department of Environmental Management's (IDEM's) draft Risk-Integrated System for Cleanup (RISC) as suggested in the USEPA's November 4, 1997 letter transmitting its comments on the July 1997 Final RFI Report.

**USEPA Comment:**
**Table 6-1 Alternate Cleanup Level Equations for Exposure to Soil**

10. *The equations used to calculate the volatilization factor (VF) are taken from U. S. EPA's Risk Assessment Guidance for Superfund (Part B) (EPA/540/r-92/003, December 1991). As indicated in the more recent U. S. EPA guidance Soil Screening Guidance: Technical Background Document (EPA/540/R-95/128, May1996), the equation to calculate VF has been updated. Table 6-1 should be revised using the most up-to-date equations to derive ACLs for the inhalation pathway.*

**Federated Metals Response:**

Federated Metals has decided to remove the Alternate Concentration Limit (ACL) discussion from the RFI report and address the establishment of clean up levels in the Corrective Measures Study (CMS) considering the Indiana Department of Environmental

Management's (IDEM's) draft Risk-Integrated System for Cleanup (RISC) as suggested in the USEPA's November 4, 1997 letter transmitting its comments on the July 1997 Final RFI Report.

**USEPA Comment:**
**Table 6-3 Comparison of Calculated Surface Soil ACLs to Maximum Detected Surface Soil Concentrations**

11. *Identify the source of the data used to determine soil saturation limits used in place of ACLs in Table 6-3. Provide this same information for Tables 6-5 and 6-7.*

**Federated Metals Response:**

Federated Metals has decided to remove the Alternate Concentration Limit (ACL) discussion from the RFI report and address the establishment of clean up levels in the Corrective Measures Study (CMS) considering the Indiana Department of Environmental Management's (IDEM's) draft Risk-Integrated System for Cleanup (RISC) as suggested in the USEPA's November 4, 1997 letter transmitting its comments on the July 1997 Final RFI Report.

**USEPA Comment:**
**Table 7-2 Comparison of Lake George Surface Water Data to Indiana Water Quality Criteria, Hammond, Indiana**

12. *The 1991 National Ambient Water Quality Criteria (NAWQC) cited in Table 7-2 are not the most recent NAWQC values available. NAWQC values from 40 CFR 131.36 (1996) should be referenced in Table 7-2 and used throughout the CSM/ACL, where appropriate, to assure that correct surface water quality criteria are used. All of the values used in the CSM/ACL should be the most recent values available to assure that correct numbers are used during calculation*

**Federated Metals Response:**

Federated Metals has decided to remove the Alternate Concentration Limit (ACL) discussion from the RFI report and address the establishment of clean up levels in the Corrective Measures Study (CMS) considering the Indiana Department of Environmental Management's (IDEM's) draft Risk-Integrated System for Cleanup (RISC) as suggested in the USEPA's November 4, 1997 letter transmitting its comments on the July 1997 Final RFI Report.

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**- FINAL -**
**REVISION 2**
# RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION REPORT FEDERATED METALS HAMMOND, INDIANA

January 1998

Prepared for

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Prepared by

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Enforcement & Compliance Assurance Branch
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**- FINAL**
**REVISION 2 -**
# RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION REPORT FEDERATED METALS CORPORATION HAMMOND, INDIANA

January 1998

*Prepared by GERAGHTY & MILLER, INC.*

Martin J. Hamper
Project Manager

Konrad J. Banaszak, PhD, CPG, PG
Project Officer

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**- FINAL -**
**RESOURCE CONSERVATION AND RECOVERY ACT**
**FACILITY INVESTIGATION REPORT**
**FEDERATED METALS CORPORATION**
**HAMMOND, INDIANA**

## 1.0 INTRODUCTION

Geraghty & Miller, Inc. has prepared this revised final report for Bridgeview Management of Perth Amboy, New Jersey, for a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) at the Federated Metals Corporation (Federated) site in Hammond, Indiana (Figure 1-1). This report summarizes the results of site investigation activities detailed in the RFI Work Plan (Geraghty & Miller, 1993) and RFI Addendum Work Plan (Geraghty & Miller, 1996) and is based on the requirements outlined in Exhibit B, Tasks IV, V, and VI, of the Consent Decree. The draft RFI report was submitted to the U.S. Environmental Protection Agency (USEPA) for review on December 20, 1996. The USEPA provided comments on the draft RFI in May 1997 and a final report addressing the USEPA comments was submitted in July 1997. The USEPA provided comments on the July 1997 final RFI Revision 1 report in November 1997. This final RFI Revision 2 report was submitted in January 1998.

### 1.1 RFI REPORT OBJECTIVE

The objective of the RFI report is to detail the methodology used for collecting environmental data representative of existing conditions. The RFI investigation includes characterization of the facility (environmental setting); source characterization; evaluation of the degree and extent of hazardous waste or hazardous constituents released from SWMUs at the site into soils, groundwater, surface water, and sediment (contamination characterization); and the identification of actual or potential receptors (potential receptor identification). Data collection

objectives, procedural details associated with the data collection, and the results associated with each of these tasks are summarized in the following sections.

# 2.0 ENVIRONMENTAL SETTING

Site-specific data collection as well as a literature review were performed to characterize the environmental setting at the site. This characterization includes a description of the hydrogeology, soils, surface water and lake sediment of Lake George, and climatological data for the site and site area.

## 2.1 SITE DESCRIPTION

The site is located in an industrial and residential area (Figure 1-1) within the city limits of Hammond, Lake County, Indiana. Facilities that are near the site include the former Amoco research facility south of the site, a portion of which is now Calumet College, the Amoco Whiting Refinery east of the site, the Bairstow site southwest of the site, and a landfill southwest of the site. Oil refining and storage operations are located east and south of the site, and large steel mills are located further east.

Figure 2-1 represents the site layout. The site contains manufacturing and office facilities (manufacturing parcel) which cover approximately 17 acres, another parcel referred to as "Outlot A," is a narrow unimproved strip located north of the manufacturing parcel consisting of approximately 2 acres. A third parcel, adjacent to Lake George, encompasses approximately 19 acres. This parcel contains no structures or other improvements; a significant portion of the parcel, however, is occupied by a landfill containing various slags and other foundry wastes.

## 2.2 HYDROGEOLOGY

In order to augment knowledge for the RFI of the site-specific hydrogeologic conditions at the site, additional geologic and hydrogeologic data were gathered during and after the installation

of the new monitoring wells at the site. Geraghty & Miller installed a total of 23 monitoring wells and 2 piezometers at the site with construction details provided in Appendix A. Locations of these monitoring wells and piezometers are shown on Figure 2-1.

During the initial phase of characterizing groundwater at the site, Geraghty & Miller installed sixteen monitoring wells (8 nested locations) consisting of eight shallow wells (designated MW-6S through MW-13S) and eight deep wells (designated MW-6D through MW-13D). The locations of these sixteen monitoring wells were approved by USEPA and installed as part of the RFI implemented scope of work. An additional monitoring well nest, MW-14S and 14D, was installed to further characterize groundwater following the initial groundwater sampling at the site. This well nest was installed near the northeast corner of the manufacturing parcel as shown on Figure 2-1. The second phase of characterizing groundwater at the site, as detailed in the RFI Addendum Workplan (Geraghty & Miller, 1996), included installing five additional monitoring wells (2 nested locations and 1 shallow well) in Outlot A, downgradient of the manufacturing parcel. Three shallow wells (MW-15S, 16S, and 17S) and two deep wells (MW-16D and MW-17D) were installed at the locations shown on Figure 2-1. All shallow wells are constructed such that the well screens intersect the water table. The bottoms of all deep well screens are positioned at the base of the Calumet Aquifer. All well screens for the nested shallow and deep wells are positioned such that each well nest monitors the total thickness of the Calumet Aquifer underlying the site.

In addition to the 23 monitoring wells, Geraghty & Miller installed two piezometers (1 nested location) consisting of a shallow and deep piezometer (designated P-1S and P-1D). Piezometers P-1S and P-1D were installed off-site, north of the facility, south of Outlot A, and approximately 15 feet south of the sanitary sewer which runs east to west adjacent to the northern property line of the site (Figure 2-1). These piezometers were installed to evaluate whether groundwater discharges to the sewer. The sewer at this location is positioned below the water table

at a depth of approximately 7 feet below grade. Groundwater modeling work in the region by the United States Geological Survey (USGS) strongly suggests that a number of sewers in the area intercept significant amounts of groundwater flow (Watson and others, 1989). Groundwater elevation data from the piezometers is used to evaluate hydraulic boundary conditions at the site.

### 2.2.1 Regional Hydrogeology

The Site (Figure 1-1) lies in an urban/industrial area of flat topography, adjacent to the north shore of shallow Lake George, approximately 3/4 mile from the southern shore of Lake Michigan. A ditch connects Lake George with the Lake George Canal, providing the only surface outlet for the lake. The Lake George Canal connects to the Indiana Harbor Canal, which in turn is open to Lake Michigan. Approximately 3,000 feet west of the site is Wolf Lake. This surface water body covers several times the area of Lake George.

The groundwater potentiometric surface in the area is extremely flat (Watson and others, 1989). Regionally, groundwater flows to the north and northeast toward Lake Michigan. Groundwater may discharge locally to small ditches, wetlands, lakes, and sewer lines. The fill, dune, and beach deposits (Calumet Aquifer) are characterized by shallow water table conditions in the site area. The saturated thickness of this aquifer in the area ranges from 25 to 30 feet (Watson and others, 1989). Boring logs of the on-site monitoring wells and off-site piezometers indicate that the average saturated thickness of the Calumet Aquifer beneath the site is 24 feet. The clay unit encountered in all deep borings represents the base of this aquifer. Seasonally, the water table is less than two feet below the surface at some locations.

An off-site groundwater investigation was conducted by Geraghty & Miller north of the site in September 1996. This investigation was in partial fulfillment of goals outlined in the "Revised

Groundwater Quality Assessment Plan" (Geraghty & Miller, 1996), submitted to the Indiana Department of Environmental Management (IDEM) in March 1996. The results of this investigation are detailed in Section 4.2.7. Off-site groundwater sampling was performed employing temporary sampling points (TSPs) in both shallow and deep portions of the Calumet Aquifer, north of the facility, to assess the lateral and vertical extent of dissolved arsenic and zinc and fluoride in groundwater. Off-site sample locations are shown on Figure 4-12. The data collected during this investigation have further characterized the regional hydrogeology and are summarized below.

To assess the hydrogeology of the Calumet Aquifer at the off-site locations prior to collecting groundwater samples, a Cone Penetration Test (CPT) penetrometer equipped with a soil Electrical Conductivity (EC) sensor was hydraulically advanced adjacent to each TSP location. In general, CPT and EC tests are utilized to evaluate soil types and soil strength. Hydrogeologic objectives using this methodology included identification of the stratigraphic position of the clay located at the base of the aquifer, any significant changes in lithology within the aquifer, and identification of the groundwater table.

The CPT-EC data identified water table conditions at depths ranging from approximately 3.5 to 6.5 feet below grade. CPT-EC logs are included in Appendix B. In some instances, water saturated conditions were difficult to interpret from the EC log due to the loose, fine-grained nature of the shallow subsurface sediments. During the off-site investigation, groundwater elevation data were collected over a period of approximately 3 weeks. The shallow groundwater elevations from TSPs were plotted to evaluate horizontal flow within the aquifer. In general, the off-site data suggests that horizontal groundwater flow is toward the west. However, the TSP data was collected over a three week time period. Also, water levels in the TSPs were allowed to equilibrate, on average, during a 30 to 60 minute time interval. This may not have been enough time to reach static water table conditions. In addition, elevation data for each TSP

location was surveyed at the ground surface. The sampling methodology dictated that depths to water be measured using the top of casing on each TSP. This difference in the surveyed and water level measuring points increases the opportunity for measurement errors to occur. Where static water level conditions were approximated in both the shallow and deep aquifer at individual TSPs, a calculation of vertical hydraulic gradients was made. Three TSPs showed no vertical gradient, one TSP showed an upward vertical gradient, and four TSPs showed downward vertical gradients. Based on the TSP locations and vertical gradients in the area of investigation, no clear pattern to the vertical hydraulic gradients in the aquifer is apparent. However, as discussed above, the groundwater elevation data collection methodology may be flawed. Also, the presence of sanitary and storm sewers in the area may affect both horizontal and vertical flow gradients in the Calumet Aquifer within the site area (R.T Kay and others, 1996).

Elevated EC readings at or immediately above the water table were encountered at several locations. These positive EC anomalies are interpreted as zones of road de-icing salts and/or sanitary sewer line leakage. Once below the water table, EC values were generally at background levels with the exception of TSP-12 (Figure 4-12, Appendix B). The EC at this location, from 26 feet to the top of the clay layer at the base of the aquifer, increased significantly above background. The positive EC values measured at this depth and location were not evident at any other location. The composition or possible source for this anomaly is unknown. However, based on the analytical results for the deep samples collected at this location as well as adjacent TSP locations, the observed EC anomaly is not associated with dissolved arsenic and zinc, or fluoride.

In general water saturated conditions were encountered within medium to dense, sand to silty sand with occasional gravel layers. The clay located at the base of the Calumet Aquifer was encountered at depths ranging from 25.9 to 33.3 feet below grade. The depth to the top of the clay at the base of the aquifer was encountered at increasing depths toward the north and east away from the site, indicating thickening of the Calumet Aquifer toward Lake Michigan. Overall, the data

provided by the CPT-EC log suggests that the aquifer is relatively homogeneous throughout the area of investigation.

The results of the off-site investigation have further characterized the hydrogeology of the Calumet Aquifer within the area of investigation north of the facility. In general, the subsurface hydrogeologic conditions identified at the off-site locations with the CPT-EC compare closely to conditions identified at the site. Historical on-site groundwater elevation data has consistently shown a flow direction toward the north across the site. Regional hydrogeologic data (Watson and others, 1989) shows groundwater at the site and north of the site flows north toward Lake Michigan. The TSP groundwater analytical data, when compared to the site monitoring well analytical data (detailed in Section 4.2.7) suggest that the off-site groundwater, north of the site, continues flowing to the north toward Lake Michigan.

### 2.2.2 Site Hydrogeology

Monitoring Wells MW-6S/MW-6D through MW-13S/MW-13D and the two piezometers P-1S/P-1D, as well as previously existing wells at the facility (MW-1, 2A, 3, T-3, and T-4), were gauged on July 17, 1995. Groundwater elevation data were also collected from the shallow and deep monitoring wells (MW-6S/MW-6D through MW-13S/MW-13D) and piezometers (P-1S/P-1D) on September 5 and 6, 1995 and October 2, 1995. This data was collected prior to groundwater sampling performed as part of the agreed order between Federated and IDEM. In addition, all site monitoring wells, including MW-14S/MW-14D and the Outlot A monitoring wells (MW-15S, MW-16S/MW-16D, MW-17S/MW-17D) were gauged on June 10, 1996.

Depths to groundwater were measured from the top of the well riser to the nearest 0.01 foot using an electric water-level indicator. The probe tape was held at a marked measuring point at the top of the riser, where the vertical elevation was surveyed. Surveying details are discussed in

Section 4.2.2.2. The probe was decontaminated between wells as per protocols described in Section 4.2.2.3. Groundwater elevation data including vertical survey data, total depths, and depths to water for July, September, and October 1995, and June 1996, are included as Tables 2-1, 2-2, 2-3, and 2-4, respectively. Groundwater is encountered from approximately 3 to 4.5 feet below land surface. Vertical flow gradients in on-site wells and the piezometers consistently show less than 0.05 feet of head differences between shallow and deep groundwater.

Comparing the data for July through October 1995, depths to groundwater were approximately 1.5 feet lower in October than July. This drop in the water table is attributed to seasonal fluctuation. The data in both shallow and deep wells and piezometers for all three months in 1995, essentially are equivalent. Therefore, only one groundwater elevation map was prepared from both the shallow and deep data. Groundwater elevation contour maps for July, September, and October 1995 are shown as Figures 2-2, 2-3, and 2-4, respectively. Generally, groundwater flow on these dates is toward the north to northeast under an approximate hydraulic gradient of 0.0025. This flow direction agrees with regional data for the Calumet Aquifer. Based on this data, Lake George and background monitoring wells MW-6S/MW-6D are upgradient from the site.

Groundwater elevation data collected for June 1996, includes data from MW-14S and 14D as well as the additional wells installed at Outlot A. A groundwater elevation contour map is included as Figure 2-5. The elevation data collected from both shallow and deep wells and piezometers for this event are approximately equivalent. Therefore, only one groundwater elevation map was prepared for shallow and deep data. In general, groundwater flow on this date is toward the north. The Outlot A wells suggest that groundwater at the northern edge of the site continues flowing to the north. However, a groundwater divide, located between the manufacturing area and Lake George is suggested by this data set (Figure 2-5). The groundwater elevation data was collected following several heavy rainfalls. The occurrence of this divide (mounding) is likely associated with the above normal precipitation as well as the elevated topography associated with

the waste slag material at the landfill. Historical groundwater elevation for the site from 1983 to 1991, as shown by ATEC monitoring well data (ATEC, 1991), showed only one instance, on November 11, 1988, where groundwater flow was to the south-southwest at the site. Regional data (R.K. Raman and others, 1996), show that this mounding typically becomes insignificant within a relatively short time period without additional precipitation.

#### 2.2.2.1 Hydraulic Conductivity Testing of Aquifer

Slug tests were performed in four selected monitoring wells to estimate the hydraulic conductivity (K) of the aquifer. Data collected from soil borings at the facility suggest that the geology of the Calumet Aquifer is relatively consistent across the site (Section 2.3.2). Therefore, the wells tested were selected to provide a real coverage of the site and coverage of both the upper and lower zones (shallow and deep monitoring wells) of the aquifer. Estimated values of K derived from the slug tests for both the upper and lower zones of the aquifer were used in conjunction with groundwater elevation data to estimate groundwater flow rates at the facility.

Monitoring Wells MW-7S/MW-7D, MW-13S/MW-13D, MW-15S, MW-16S/MW-16D, and MW-17S/MW-17D were selected for the aquifer tests. Locations of the monitoring wells are shown on Figure 2-1. The tests were conducted by Geraghty & Miller on September 11, 1995 (MW-7 and MW-13 locations) and June 14, 1996 at the Outlot A monitoring wells. Tests were performed using a solid slug, a data logger, and a pressure transducer probe. The slug test raw data and calculations are included in Appendix C. The following procedures were followed while conducting the slug tests:

1) The static water level in the well was measured using an electronic water level indicator.

2) The transducer probe was lowered into the well to approximately 7 to 10 feet below the water table (within the pressure range of the transducer). The transducer cable was secured to the well casing with tape.

3) The data logger was started approximately 10 seconds prior to lowering the slug to ensure accurate pre-test data. The PVC slug was submerged rapidly into the well (without causing an impact on the water surface) and the water level in the well was allowed to equilibrate (water level equilibration occurred in the wells after approximately 1 minute).

4) Following the introduction of the slug, data collection, and equilibration of the water levels in the wells, the slug was rapidly removed for the second part of the test (slug out). During removal of the slug at the MW-7 and MW-13 locations, the pressure transducer probe cable and slug interfered with one another causing the pressure transducer to raise in the wells. This interference occurred on several attempts as a result of limited annular space inside the 2-inch diameter wells. Since the pressure transducer position changed during the slug out portion of the tests, only the "slug in" test data were used to estimate values of K for MW-7 and MW-13.

5) The slug and probe were decontaminated between wells to prevent cross contamination. Dedicated rope was used for the slug at each location. Decontamination procedures consisted of washing the equipment with a 2 percent non-phosphate detergent or equivalent solution followed by a thorough rinsing with deionized water.

The Calumet Aquifer is unconfined. Data collected during the slug tests were evaluated using the Bouwer and Rice Method to estimate the hydraulic conductivity for unconfined aquifers

(Bouwer and Rice, 1990). Geraghty & Miller's Aqtesolv™ personal computer software was used to execute the Bouwer and Rice solution. A summary of the hydraulic conductivity test data is included on Table 2-5. Estimated values of K for the uppermost portion of the aquifer range from 227 feet per day (ft/day) at MW-7S to 633 ft/day at MW-13S for an average K value for the shallow aquifer of 372 ft/day. The estimated K for MW-13S is approximately 2 to 3 times higher than the estimated K at the other wells. MW-7S, 15S, 16S, and 17S are screened across the sand unit whereas the screened portion of the aquifer at MW-13S primarily consists of gravely sand. The slug test results suggest that the gravely sand, where present, may have an overall higher K than the adjacent sand unit. However, since the gravely sand is not continuous across the site, the higher K value is not representative of the aquifer. Estimated values of K for the lower portion of the aquifer range from 95 ft/day at MW-16D to 205 ft/day at MW-13D for an average of 152 ft/day. These lower K values would be expected in the silty sand. Excluding MW-13S, the estimated K for shallow and deep wells in the Calumet aquifer is 229 ft/day. This value is higher than the literature reported K value of 130 ft/day for the Calumet Aquifer within Lake County (Fenelon and others, 1993).

The rate of contaminant transport in groundwater is dependent on the groundwater flow direction and velocity. The average linear velocity is equal to:

$$K\ I/n$$

where K = hydraulic conductivity for the lower portion of the aquifer in feet per day (229);
I = hydraulic gradient (0.0025); and
n = effective porosity (assumed to be 0.30).

The calculated average linear velocity for groundwater is estimated to be 1.9 ft/day. This rate of migration assumes homogeneity of the subsurface materials.

## 2.3 SOILS

Data collected during a literature review as well as an off-site groundwater investigation have characterized the regional geology of the site area. Characterization of the on-site and near-site subsurface geologic materials was performed using continuous split-barrel core (split spoon) sampling while installing the deep monitoring wells and deep piezometer. Detailed descriptions of the soil column at each well nest were recorded by a Geraghty & Miller field hydrogeologist. The pH of split-spoon soil samples were measured in the field and selected soil samples were submitted to a geotechnical laboratory for grain-size characterization, moisture content, measurement of cation exchange capacity, and calcium carbonate equivalency.

### 2.3.1 Regional Geology

The region surrounding the site is underlain by about 150 feet of unconsolidated deposits of Pleistocene and Holocene age. Underlying the unconsolidated deposits is carbonate bedrock of Silurian Age. The unconsolidated deposits consist of an upper layer of beach and dune deposits that range in thickness from 0 to 65 feet. In many locations, the beach and dune sediments are overlain by slag fill. The fill material, beach, and dune sediments are collectively known as the Calumet Aquifer and are underlain by glacial till and lacustrine clay. The dune sediments are well-sorted, predominantly quartz sand. The beach sediments consist primarily of sand but also contain gravel, silt, and organic deposits. The glacial till consists mainly of clay and silt layers but can contain sand layers (Watson and others, 1989).

The off-site groundwater investigation conducted by Geraghty & Miller in September 1996 further characterized the geology of the Calumet Aquifer north of the site. The results of off-site CPT-EC measurements at each TSP characterized the geology at twenty off-site locations from the surface to a maximum depth of 37.5 feet below grade. Results of this investigation are detailed in Section 4.2.7. Locations of the TSPs are included on Figure 4-12. In general, subsurface sediments

consist of medium to dense, sand to silty sand with occasional gravel layers. Gravely zones, where present, are generally found above depths of 20 feet. Relatively thin clay layers were encountered at two off-site locations at depths of 25 and 18 feet, respectively, and a soft to firm clayey silt to silty clay was encountered from 5 feet to 15 feet below grade at another TSP. Immediately above the base of the Calumet Aquifer, a gradual decrease in the cone end bearing resistance is evident at all TSP locations, showing a repeating, characteristic profile. This profile is interpreted as a gradational fining downward sequence from sand to a sandy silt. Immediately below this gradational zone, the clay located at the base of the Calumet Aquifer was encountered at depths ranging from 25.9 to 33.3 feet below grade. The depth to the top of the clay at the base of the aquifer increases toward the north and east (lakeward thickening of the Calumet Aquifer). Overall, the data provided by the CPT-EC log corresponds well with the stratigraphy identified in on-site borings. The CPT-EC logs for all twenty TSPs are included as Appendix B. This close comparison suggests that the aquifer is relatively homogeneous throughout the area of investigation.

### 2.3.2 Site Geology

Continuous split-spoon samples were collected at each nested well location from the deep monitoring well and piezometer using 2-foot length, 2-inch outer diameter split-spoon samplers. Since MW-15S is not a nested location, continuous samples were collected from this well using the same methodology described above. Samplers were advanced inside 4 1/4-inch inner diameter hollow stem augers using a drilling rig equipped with a standard 140-pound hammer and 30-inch drop. The number of hammer drops (blow counts) for each 6-inch interval are included on the Soil Boring Logs in Appendix D.

Split-spoon soil samples were described in the field by a Geraghty & Miller hydrogeologist utilizing procedures found in "Field Pocket Guide to Description and Sampling of Contaminated Soils" (USEPA, 1991) as guidance and in accordance with "Unconsolidated Deposit Descriptive

Requirements, IDEM". Soil sample descriptions are detailed on the boring logs in Appendix D. The site subsurface has been characterized to a depth of 30 feet below grade. Geologic cross-sections were constructed based on the soil boring data. The locations of these lines of cross-section are shown on Figure 2-6.

Geologic cross-section A-A' is shown as Figure 2-7 and depicts the subsurface stratigraphy from north to south across the site. Geologic cross-sections B-B' and C-C', which depict the subsurface stratigraphy from west to east across the site, are included as Figure 2-8. Surface material encountered at each boring range from crushed rock fill (peninsula) at MW-6D, smelter slag fill material at MW-7D, MW-8D, MW-10D, MW-11D, rail ballast fill material at P-1D, asphalt at MW-9D and MW-13D, concrete at MW-12D and MW-14D, and topsoil at MW-15S, MW-16D, and MW-17D. The various fill thickness ranges from none at the Outlot A wells to 1.5 feet at MW-13D to 6 feet thick at MW-10D. Where fill material was encountered, underlying native soil was generally encountered at abrupt contacts with the overlying fill. The uppermost native soils at the site (excluding the native topsoil at the Outlot A wells) range from a silt at MW-7D, to a gravely sand at MW-6D, MW-10D, MW-12D, and MW-13D to a loamy sand to sand at the remaining soil boring locations.

Water saturated soil was encountered within native soil at depths ranging from 1.5 to 4 feet below grade. The discontinuous silt and gravely sand, where encountered, overlay a sand and loamy sand. This sand unit is encountered at depths ranging from 1 to 10.5 feet below grade and is contiguous across the site. Overall, this unit has an approximate thickness of 20 feet. Underlying this sand unit, at depths ranging from 20 to 24.5 feet below grade is a silty sand. This unit is also continuous across the site and has an overall average thickness of 5 feet. The thickness of the silty sand unit increases to 9.5 feet at MW-6D and generally decreases in thickness toward the north. Underlying the silty sand unit at all locations is a plastic clay. The clay was encountered at an average elevation of 556.00 feet above mean sea level (Figures 2-7 and 2-8).

All soil borings were terminated within the upper 1 foot of the clay. Based on boring log data, the approximate saturated thickness of the Calumet Aquifer beneath the site is 24 feet. The clay unit encountered in all borings represents the base of this aquifer. The site specific geology agrees with regional geologic studies conducted in the site area.

The pH of split-spoon soil samples was measured in the field using a HyDac Model 910 field pH meter. Calibration for the pH field meter was performed daily using buffer solutions of pH 7.01 and pH 10.01. Measurements for pH in soil are included on the boring logs in Appendix D. Values for pH ranged from 7.10 in the 10 to 12 foot and 18 to 20 foot sample intervals collected at MW-6D, to a pH of 11.09 in the 2.5 to 4.5 foot sample collected from MW-9D. The average pH value in sand from the background well (MW-6D) was 7.17. Average soil pH values in the downgradient wells (MW-7D through MW-14D) ranged from 7.41 at MW-7D to 8.80 at MW-9D.

The three major sediment types identified in the subsurface at the site include sand, silty sand, and gravely sand. One representative soil sample from each of these major sediment types was submitted for geotechnical analysis. These samples were collected from selected borings and submitted to a laboratory for particle-size analysis using ASTM D422, laboratory determination of moisture content by ASTM D2216, calcium carbonate equivalency (CCE) by AOAC Method 955.01, and determination of cation exchange capacity (CEC) by USEPA Method 9081. The soil samples were collected by split-spoon from MW-8D, MW-12D, and MW-13D. The sample submitted from MW-8D was collected from the 24-26 foot interval near the base of the aquifer. This sample is representative of the silty sand unit which overlies the confining clay layer beneath the site. The soil sample from MW-12D was collected from the 5-7 foot interval and is representative of the gravely sand which underlies a portion of the site beneath the overlying fill material. The soil sample collected from 10.5-12.5 foot at MW-13D is representative of the sand unit which is encountered in all soil borings below the gravely sand and above the silty sand unit.

Soil samples were placed in clean, standard geotechnical soil sample jar and shipped with chain-of-custody documentation to Bowser-Morner, Inc. in Dayton, Ohio. Analytical results are included with the laboratory report in Appendix E.

The results for particle size analysis, moisture content, CEC, and CCE are included in Table 1 of the analytical report in Appendix E. The gravely sand sampled at MW-12D showed 3% gravel, 94% sand, 2% silt, and 1% clay. The moisture content of the gravely sand (MW-12D) was 18.3%. CEC, expressed as milli-equivalency per 100 grams (meq/100g) for the gravely sand was 0.72. The CCE for gravely sand 18.1%.

The sand sample from MW-13D showed 91% sand, 8% silt, and 1% clay. The moisture content in the sand (MW-13D) was 23.6%. CEC for the sand unit was 1.19 meq/100g. The CCE for the sand was 34.8%.

The particle (grain) size distribution at MW-8D (silty sand) showed 54% sand, 42% silt, and 4% clay. The moisture content in the silty sand (MW-8D) was 25.1%. The CEC for the silty sand was 1.87 meq/100g. The CCE for silty sand was 45.5%.

These results, when compared to the soil sample descriptions from the soil boring logs, show close agreement between laboratory and field classification for the three major soil types. These values for moisture content are consistent with these three sediment types. These low values for CEC are consistent with the corresponding sediment type and indicate the sediments have a low capacity to attenuate any releases of foundry waste or other constituents by cationic exchange.

These CCE numbers suggest that calcium carbonate is prevalent within the subsurface sediments at the site at concentrations which would provide carbonate ions to groundwater. Metal carbonates are relatively insoluble salts and free carbonate could sequester metals at the site in the

subsurface. This reaction would tend to attenuate metals. The CCE is consistent with field measurements of pH in soil samples (average range of pH values in soil were 7.17 to 8.80) as well as hydrochloric acid reactions observed in soil samples (see boring logs in Appendix D).

## 2.4 LAKE GEORGE SURFACE WATER AND SEDIMENT

Lake George is located adjacent to and south and west of the site. The lake is surrounded by industrial and residential development and is bounded by Calumet Avenue to the west, New York Avenue to the east, 129th Street to the south and 122nd Street on the north. A causeway (125th Street), divides the lake into north and south basins (Figure 1-1). The northeastern shoreline of the north basin and an associated wetland is located adjacent to the site (Figure 2-1).

The Illinois State Water Survey performed a diagnostic-feasibility study of Lake George from July 1992 through November 1993, hereafter referred to as the lake study. The objective of this lake study was to assess the present condition of the lake and recommend an integrated protection/mitigation plan for the lake and associated watershed (R.K. Raman and others, 1996). The results of the lake study that characterized the environmental setting of Lake George and the applicable data from this report are referenced below.

### 2.4.1 Surface Water

The limited drainage area of Lake George consists of 374 acres. This area includes the 148-acre lake, 173 acres of open soil, and 53 acres of impervious material. The original surface area of the lake has been significantly reduced in the past through filling for industrial expansion (R.K. Raman and others, 1996). Precipitation that does not infiltrate into the soils at the site, appears to drain to Lake George (Geraghty & Miller, 1992). A shallow ditch, located along the north boundary of the manufacturing parcel, drains the northern portion of this parcel. Drainage in this ditch appears to be toward Lake George to the west. On the southern part of the manufacturing

area, surface water would drain toward the southeast. Surface water then would drain south through the landfill parcel and into a swale on the south side of this parcel that enters the marshy area. Runoff on the landfill would generally drain toward Lake George or toward the facility. Runoff draining toward the facility would flow through shallow ditches eastward towards the marshy area.

A bathymetric survey conducted for the lake study showed that the maximum water depth in the lake is 4 feet in the north basin and 3.5 feet in the south basin. Average depths were 1.8 feet and 2.2 feet in the north and south basins, respectively.

The hydrologic budget for Lake George, measured during a one-year period (R.K. Raman and others, 1996), showed 75% of the inflow volume to the lake was through direct precipitation, 13 percent was watershed runoff, and 12 percent unmeasured inflow volume. Outflow volume was estimated at 66 percent evaporation, 10 percent was allotted for surface runoff with no substantiation, and 24 percent allotted to unmeasured volume. Surface water drainage from Lake George would be through the Calumet Avenue ditch to the Lake George canal (Figure 1-1). The results of the study (R.K. Raman and others, 1996) suggests that sedimentation of the Calumet Avenue ditch over the years has resulted in higher surface water levels in Lake George.

Elevation data collected for the lake study during the period October 1992 to January 1993 indicates that groundwater flow is from the Lake George to the Calumet Aquifer. Historical site-specific groundwater elevation data (as described in Section 2.2.2), also shows this relation exists. The exception to this relation is that groundwater flows from Wolf Lake to Lake George (Watson and others, 1989, R.T. Kay and others, 1996). This groundwater relation between Wolf Lake and Lake George is the result of artificially high water levels in Wolf Lake likely caused by industrial discharges (R.T. Kay and others, 1996).

Surface water characteristics of Lake George were evaluated during the lake study. Those physical characteristics that were measured include pH, alkalinity as $CaCO_3$, conductivity, chloride, solids, phosphorous, nitrogen, and chemical oxygen demand (COD). The water quality characteristics for the north basin of Lake George, are summarized in Table 2-5 (R.K. Raman and others, 1996). Values of pH in the north basin ranged from 7.68 to 8.97. The higher than normal pH values in the north basin were attributed to photosynthesis (R.K. Raman and others, 1996). In the south basin, pH ranged from 8.50 to 10.37. The higher pH values detected in the south basin were suspected to be from runoff and leachate from the Bairstow slag piles (R.K. Raman and others, 1996). Total alkalinity ranged from 81 to 182 mg/L in the north basin and 46 to 181 mg/L in the south basin. These results suggest the lake is well buffered, and typical of midwestern lakes. Mean conductivity values are 723 and 691 umho/cm in the north and south basins, respectively. The conductivity values are nearly twice the values observed for Illinois lakes and may be a result of runoff from the Bairstow site, and adjacent industrial areas (R.K. Raman and others, 1996). Mean chloride values detected in the north and south basins (67 and 71 mg/L, respectively) were not unusual. Total dissolved solids detected in north and south basins were within the limit of 750 mg/L as specified by the Indiana Pollution Control Board (Title 327). The mean of total phosphorous concentrations detected were 0.06 mg/L for the north basin and 0.11 mg/L for the south basin. Based on phosphorous results, the lake is expected to remain eutrophic (R.K. Raman and others, 1996). The majority of nitrogen detected in the surface water (approximately 80 percent) of Lake George constitutes nitrogen of organic origin. There was no substantial difference in nitrogen levels between basins. The maximum total ammonia concentration observed is well below regulatory criteria. Levels of COD observed (mean values of 31 and 58 mg/L for north and south basins, respectively), indicate that lake water has a high degree of organic enrichment (R.K. Raman and others, 1996).

### 2.4.2 Lake George Sediments

The lake study suggests that in the north basin of Lake George, lake bed sediments were less than 0.5 feet thick and range from 0.5 to 2.0 feet thick in the south basin. Lake bed material sampling for the lake study describes the lake bed (both basins) as composed of an organic muck layer covering a sandy substrata. The thickness of the organic layer in the north basin was consistently 0.5 feet (R.K. Raman and others, 1996).

Lake sediment sampling was performed by Geraghty & Miller in June 1996 using a hand-held auger or scoop (Section 4.3). At several lake sediment sampling locations, an organic mat layer was encountered from the lake bed surface to depths of 0.5 to 1.0 feet. Below the organic material, native sediment was encountered. Cores were advanced to a maximum depth of 2.0 feet below lake bottom. The uppermost lake sediment was described as a silty, fine to medium-grained sand with occasional gravel. The results of the lake study and the sediment characterization performed by Geraghty & Miller agree.

In addition to lake sediment sampling performed by Geraghty & Miller, there have been several studies that have included sampling of bottom sediments in Lake George. Historical sediment data have previously been summarized by Geraghty & Miller in the RFI Task I report (Geraghty & Miller, 1992) and in the lake study report (R.K. Raman and others, 1996).

The results of sediment data collected by Geraghty & Miller in June 1996 are included in Section 4.3.5. These samples were collected adjacent to the waste landfill located at the site. Sediment samples for the lake study (R.K. Raman and others, 1996) were collected from three locations in the north basin and four locations in the south basin. For sediment characterization purposes, a summary of the results of this sampling are included below.

Sediment samples collected from the north basin were designated LGN, LGN1 and LGN2. Sediment samples from the south basin are designated LGS, LGS1, LGS2, and LGO (the LGO sample was collected at the Lake George outfall). The approximate locations are included on Figure 2-9. Both surficial sediment samples and core sediment samples were collected at each location. Core samples consisted of top, middle, and bottom samples. Laboratory analysis for both surficial and core samples includes total metals, total phosphorous, total nitrogen, chemical oxygen demand (COD), total solids, volatile solids, total organic carbon (TOC), and density. The analytical results for both surficial and core sediments are summarized in Tables 2-6 and 2-7, respectively. In addition, TCLP metals, TCLP PCBs, and TCLP pesticides, were analyzed at each location. The TCLP analytical results are summarized in Table 2-8.

The results for sediment analyses (excluding TCLP results) were compared to Indiana maximum background concentrations for total metals and Illinois maximum normal concentrations for total metals, total phosphorous, COD, volatile solids, and TOC. Total metals exceeding both the Indiana and/or Illinois background levels in the surficial sediment samples include cadmium, copper, lead, and zinc at LGN1, at concentrations of 4.04, 293, 195, and 581 mg/kg, respectively, and zinc at LGN and LGS at concentrations of 234 and 199 mg/kg, respectively. For the core samples, parameters exceeding Indiana maximum background and/or Illinois maximum normal concentrations for lake and stream sediments were detected at LGN, LGN1, LGS, and LGO. At LGN and LGS, constituents exceeding these background values were detected in the top core sample only and for cadmium (2.12 and 2.17 mg/kg), lead (163 and 197 mg/kg), and zinc (309 and 337 mg/kg). At LGN1, only copper in the middle sample exceeded background at a concentration of 121 mg/kg. At LGO, lead in the bottom sample (152 mg/kg) and zinc in both middle and bottom samples (242 and 294 mg/kg, respectively) were detected above background. In addition to metals, volatile solids exceed background in the top sample collected at LGS (17 percent), and top, middle, and bottom samples at LGO (all at 14 percent).

The results for TCLP metals, PCBs, and pesticides are presented in Table 2-8. The results for all TCLP parameters in lake sediments were below regulatory limits.

## 2.5 CLIMATOLOGICAL CONDITIONS

The Chicago metropolitan area has a temperate continental climate ((R.K. Raman and others, 1996). Warm season (March to November) climate conditions are dominated by maritime tropical air flow from the Gulf of Mexico. Winters can be severe and represent a distinct cold season with frequent frost and snowfall. The period from November through March is dominated by Pacific air. However, four to six times each winter, cold, dry air from the Canadian Arctic moves south, taking temperatures below 0 degrees Fahrenheit (°F).

The climate of the Chicago metropolitan area is influenced by urbanization and Lake Michigan. Within a few miles of Lake Michigan, the climate is modified by lake breezes, and temperatures are warmer in winter and cooler in summer by 2 to 5 °F. The closest location to the site where a wind summary has been compiled is for Chicago O'Hare International Airport. From this data, the predominant wind direction is from the south-southwest (9.9 percent of the time).

Summer precipitation averages 4 inches per month, mostly in the form of showers and thunderstorms. Summer winds are generally from the southwest. Snowfalls of 6 inches or more occur every other year on average, with snow cover often persisting for several weeks.

Long term records are available from a climatological station at the University of Chicago, 12 miles northwest of the project area. These records indicate that temperatures range from -24 °F to 104°F with an average annual temperature of 49.1 °F . The average January

temperature is 31.5 °F while the average temperature for July is 84.2 °F . Average annual precipitation is 37.33 inches, and average snowfall is 26.95 inches.

According to the State Climatologist, additional local climatological data, including atmospheric pressure (collected only during daylight hours at Gary Regional airport), evaporation data, inversion development, and climate extremes are unavailable for Lake County.

## 2.6 ENVIRONMENTAL SETTING SUMMARY

The three major sediment types identified in the subsurface at the site are gravely sand, sand, and silty sand. In general, water saturated conditions are encountered near the contact between the overlying fill material and the native sediments. Groundwater elevations measured in both shallow and deep wells and piezometers at the site are essentially equivalent. Generally, groundwater flows toward the north to northeast at the site under an approximate hydraulic gradient of 0.0025 and a calculated average linear velocity of 1.9 ft/day. Off-site data suggests that groundwater continues flowing to the north toward Lake Michigan. However, underground sewers may affect local groundwater flow. In general, site-specific hydrogeologic and geologic data agrees with regional data. With the exception of the June 1996 groundwater elevation data set; site data, the results of the lake study (R.K. Raman and others, 1996), and the results in Kay and others (1996), show Lake George as well as background monitoring wells MW-6S/MW-6D are upgradient from the site.

Based on the water quality results of the lake study, with the exception of pH in areas of the south basin (pH exceedances in the south basin were attributed to runoff and leachate from the Bairstow site), chemical quality characteristics for which standards are available in Indiana, were all within required limits (Indiana Pollution Control Board, Title 327). Total metals exceeded

background in sediment samples collected from both north and south basins. Those metals detected at concentrations exceeding background levels determined for sediment in Indiana and Illinois streams and/or lakes, were cadmium, copper, lead, and zinc. Exceedances were detected in both north and south basins of Lake George. The lake study concluded that the major problems associated with Lake George are the deteriorated condition of the outlet structure (located along Calumet Avenue at the southwest corner of the lake), the profusion of aquatic macrophytes, the shallow depth, and the white precipitate in the south basin associated with the Bairstow site.

# 3.0 SOURCE CHARACTERIZATION

Source characterization was performed to identify waste type(s), quantity, physical form, disposition, and facility characteristics affecting any release(s) from solid waste management units (SWMUs) previously identified at the site (Geraghty & Miller, 1992). Analytical data were collected at those SWMUs presently containing slags and other foundry wastes to identify waste composition and identify potentially leachable heavy metals. In addition, the possibility of contamination by organic chemicals in the foundry waste landfill, where solvents or other wastes containing organic constituents may have been disposed, was investigated.

## 3.1 SITE HISTORY

Federated produced copper, lead, and zinc-based alloys in a scrap metals smelting operation at the site from 1937 to 1983. On February 18, 1983, Federated permanently closed the manufacturing facility. Corporate and sales offices continued to be maintained at the site, along with warehoused product. In January, 1985, the corporate offices were relocated to New York and the sales office was closed. Later in 1985, the 17-acre manufacturing portion of the facility was sold. Federated retained ownership of the 19-acre portion of the property containing the foundry waste piles and the unused 2-acre parcel, Outlet A. Though not the present owner of the manufacturing parcel, Federated is addressing this portion of the site in the RFI, as well as the waste piles on the landfill parcel. The RFI for the manufacturing parcel addresses only activities carried out during the period of Federated's ownership and operation of the facilities within the parcel, to the extent that such operations are separate and distinct from those of the new occupants. Presently, four separate operations occupy the former Federated manufacturing parcel: Accurate Metals, Saxon Metals, American Solder, and Globe Roofing. Accurate Metals and Saxon Metals are engaged in scrap metal reclamation; American Solder produces specialty solders and specialty

casting metal; and Globe Roofing warehouses shingle roofing materials and several related products.

## 3.2 SOLID AND HAZARDOUS WASTE GENERATION

Site processes consisted of four principal operations; each operation contained subprocesses (Federated, 1980). The principal operations and subprocesses are summarized below.

- Copper-based alloys (Brass Department) operation.
  Subprocesses included brass furnaces, copper and brass anode manufacture, and Cupola operation.

- Lead-based alloys (Lead Department) operation.
  Subprocesses included kettle refining and lead reverb dross smelting.

- Zinc alloys and zinc dust (White Metal Department) operation.
  Subprocesses included the zinc dust operation, kettle operations, and furnace operations.

- Nickel sulfate operation.
  Subprocesses included digestion and treatment of a nickel crude from copper refining operations.

The 1980 Part A Application lists hazardous wastes generated at the facility. These hazardous wastes are D008, D006, F001, and K069. A summary of the wastes produced (not including

intermediate materials that were recycled), their process origins, and estimated total quantities (Federated, 1980) is provided below.

| Waste | Process | Amount Produced[1] | Hazardous | Waste Code |
|---|---|---|---|---|
| Copper-Base Alloys | | | | |
| Zinc Fume | Brass Furnaces<br>Copper-Base Cupola Operation | 3,000 | No | NA[2] |
| Blast Furnace Slag | Copper-Base Cupola Operation | 16,200 | No | NA |
| Hopper Dust | Copper-Base Cupola Operation | 358 | No | NA |
| Used Baghouse Bags | Furnace Operation | | Yes | D008 |
| Used Firebrick | Furnace Operation | | Yes | D008 |
| Lead-Base Alloys | | | | |
| Tin/Lead Fume | Lead Reverb Operation | 1,600 | Yes | K069 |
| Low Tin Slag | Lead Reverb Operation | UNK[3] | Yes | D008 |
| Used Baghouse Bags | Lead Reverb Operation | UNK | Yes | D008 |
| Used Firebrick | Lead Reverb Operation<br>Lead Kettle Operation | UNK | Yes | D008 |

[1] Approximate Amounts in Tons

[2] Not Applicable

[3] Unknown

| | | | | |
|---|---|---|---|---|
| Zinc-Base Alloys | | | | |
| Zinc Sludge | Kettle Operation | 783 | Yes | D008, D006 |
| Waste | Process | Amount Produced[1] | Hazardous | Waste Code |
| Other | | | | |
| Used Firebrick | Furnace/Kettle Operation | UNK | Yes | D008 |
| Used Chlorothene | Maintenance | UNK | Yes | F001 |
| Spent Acid | Anode Cleaning | UNK | No | NA |
| Empty Drums | Formerly Stored | UNK | No | NA |
| Cardboard, Pallets | Used to Store Materials Acid | UNK | No | NA |
| Waste Oil | Motor and Other Oils | UNK | No | NA |
| Metal Hydroxide Sludge | Nickel Operation | 238,000 | No | NA |

[1] Approximate Amounts in Tons

## 3.3 IDENTIFICATION OF SWMUS

Ten SWMUs, as identified in the RFI Workplan (Geraghty & Miller, 1993), designate areas where wastes were formerly stored or are presently stored at the site. Locations of identified SWMUs are shown on Figure 3-1. A detailed description of SWMUs at the site and the information sources used to determine the nature and location of the SWMUs is provided in the Task 1 report (Geraghty & Miller, 1992). These SWMUs are described using information supplied to Geraghty & Miller by Federated as follows:

- The foundry waste piles within the 19 acre landfill parcel outside the fenced area are SWMU #1. The 1985 Closure Plan submitted to IDEM states that the waste piles on SWMU #1 have been in place for approximately 40 years and contain approximately 100,000 cubic yards of various slags and other foundry waste including baghouse bags & zinc sludge.

- The existing slag materials along the inside of the perimeter fence constitute SWMU #2.

- Photo-documented locations formerly used to store foundry waste materials (ATEC, 1985) within the manufacturing parcel are designated SWMU #3.

- Baghouse bags (tin-lead fume) were formerly stored in a waste hauler container in the area designated SWMU #4.

- Zinc sludge was formerly stored in drums in the area designated SWMU #5.

- SWMU #6 contains areas where zinc sludge was formerly stored in piles.

- Prior to the facility being sold, light iron, such as empty acid drums, was stored at SWMU #7, located near the southwest corner of the manufacturing parcel.

- The main baghouse contains whitish dust and is SWMU #8. This material is on a concrete floor and is under a roof. A smaller baghouse, located immediately south of the main baghouse is also a part of SWMU #8. Waste piles located on the concrete pad of this uncovered baghouse contain similar whitish dust.

- A waste oil underground storage tank (UST) was removed from the area identified as SWMU #9.

- The waste 1,1,1-trichloroethane (1,1,1-TCA) operation consisted of dipping rags in 1,1,1-TCA and using the rags to clean materials in the maintenance area now designated to be SWMU #10. The rags were then allowed to dry causing the 1,1,1-TCA to evaporate. There was no storage of liquid waste 1,1,1-TCA in SWMU #10.

Locations of the ten identified SWMUs (#1 through #10) as described above are included on Figure 3-1. SWMUs #1, #2, and #8 are the only identified SWMUs presently containing waste materials. These SWMUs, particularly the landfill (SWMU #1), contain waste materials representative of all varieties of waste generated at the site (Geraghty & Miller, 1992). SWMU #1 consists of the landfill outside the fenced area, presently containing various slags and related foundry wastes. SWMU #2 contains visible waste slag materials presently located within the fenced area of the manufacturing parcel. SWMU #8 is the main baghouse and former small adjacent baghouse.

## 3.4 SWMU #1 AND SWMU #2 CHARACTERISTICS

The slags contained within SWMUs #1 and #2 are similar in composition since they were derived from the same processes but simply placed in different locations. The following is a description (Geraghty & Miller, 1992), of the varieties of foundry waste generated by Federated and placed in SWMUs #1 and #2:

- Blast furnace slag from cupola operations. This material is described as being lava-like.

- Zinc oxide fume from the brass and cupola operation. It is described as a gray powdery material. The zinc oxide fume may be also associated with baghouse bags.

- Tin/lead fume. This material would only be placed in the landfill as part of baghouse bags. This material is described as a yellow powdery material.

- Low tin slag. This material is described as a lava-like material.

- Hopper dust. This material was described as a gray, coarse powdery material.

- Zinc sludge. No description is provided of this material.

- Used firebrick. This material is described as a refractory brick that is metal impregnated.

Geraghty & Miller personnel have identified ten visually distinguishable "types" of slag/foundry waste in the landfill (SWMU #1) and inside the manufacturing parcel adjacent to the landfill (SWMU #2). Three grab samples of each of the descriptive categories listed were collected from these SWMUs. Waste sample locations are shown on Figure 3-2. Sample locations are designated waste grab WG 8 through WG 37. The three samples collected from each category were composited into one sample by the analytical laboratory. The composite sample contains equal parts by weight of each of the three samples. The visually distinguishable waste types and corresponding sample identification numbers are described as follows:

1) Slag covered yellow brick, some brick fragments are light purple, some brick fragments contain no slag coating - Sample ID#s WG-8,9,10.

2) Dull, weathered, rust colored and earthy brown slag, fresh surfaces are glassy and very dark brown or black - Sample ID#s WG-11,12,13.

3) Black glassy slag - Sample ID#s WG-14,15,16.

4) Yellow coated black and dark green glassy slag - Sample ID#s WG-17,18,19.

5) Pumice like, light, dark gray, and black - Sample ID#s WG-20,21,22.

6) Gray slag and bluish gray powdery slag (sample ID# WG-24 had bright aqua stain) - Sample ID#s WG-23,24,25.

7) Gray brown spall, platy, distinct weathering pattern - Sample ID#s WG-26,27,28.

8) Earth brown spall, platy - Sample ID#s WG-29,30,31.

9) Light gray powder (appearance similar to baghouse dust) - Sample ID#s WG-32,33,34.

10) Dark gray and black powdery, sandy, granular slag - Sample ID#s WG-35,36,37.

Some of these apparent waste types may represent essentially the same foundry waste in different states of weathering, or may originate from slightly different process conditions. Likewise, it is possible that two apparently similar wastes may actually have different origins.

## 3.5 SWMU #8 CHARACTERISTICS

SWMU #8, the old main baghouse and a former adjacent small baghouse, contains fine, light-colored dusts which may be a type of fume. According to former Federated personnel, the baghouse rooms in the west half of the main baghouse handled a different type of fume than the rooms in the east half. Three grab dust samples from the west half and three grab dust samples from the east half of the main baghouse were collected. Sample locations are designated WG-1 through WG-6 and are shown on Figure 3-2. In addition to the main baghouse, one waste grab sample was collected from the former adjacent small baghouse (WG-7) as shown on Figure 3-2. The three samples collected from the western half of the main baghouse, designated WG-1, 2, and 3 and the grab samples collected from the eastern half, designated WG-4, 5, and 6 were each composited into one sample by Asarco as discussed in Section 3.6.2.1. The composite samples contain equal parts by weight of each of the three samples. Grab sample WG-7 was not composited. Samples were submitted for total metals and TCLP metals testing.

## 3.6 WASTE CHARACTERIZATION/SWMU #1 AND SWMU #2

The initial characterization of SWMUs #1 and #2 began with a subsurface gas survey. This sampling was performed to identify any areas within SWMUs #1 and #2 where disposal of commonly used volatile organic solvents may have occurred. Existing records do not indicate that such disposal occurred. The results of the soil gas survey were incorporated into the RFI to subsequently direct the number and locations of soil samples to be collected for organics analyses at these two SWMUs (see Section 3.6). Subsequently, waste sampling for SWMUs #1 and 2 consisted of sampling each known type of waste material, analyzing the samples for total inorganic hazardous waste (Appendix IX) constituents, fluoride, and Toxicity Characteristic Leaching Procedure (TCLP) metals.

### 3.6.1 Subsurface Gas Sampling

Subsurface gas sampling locations were located on a 50-foot grid spacing within SWMUs #1 and #2. Minor variances to the grid spacing occurred where large slag boulders on the surface are present. Where detectable concentrations of volatile organic compounds (VOCs) occurred during the subsurface gas sampling, additional delineation locations were flagged and subsequently sampled. These delineation sample locations are in addition to the 50-foot grid spacing. A total of 234 sampling locations were flagged, numbered, and surveyed to $\pm$ 1.0 feet in the horizontal direction by a licensed surveyor with Ruettiger, Tonelli & Associates. Inc. of Naperville, Illinois.

Sampling locations, designated SG-1 through SG-234, are shown on Figure 3-3. The soil gas survey was performed utilizing a portable van-mounted gas chromatograph (GC). Samples of soil gas were collected at each sampling point and screened for target VOCs. The field GC screening included analysis for benzene, toluene, ethylbenzene, and total xylenes (BTEX), trichloroethene (TCE), 1,1,1-trichloroethane (1,1,1 TCA), tetrachloroethene (PCE), 1,1-dichloroethane (1,1 DCA), 1,1 dichloroethene (1,1 DCE), and cis-1,2-dichloroethene (c-1,2 DCE).

Subsurface gas collection and mobile analytical services were provided by Plains Environmental Services (Plains), Salina, Kansas with oversight provided by Geraghty & Miller. Sampling was performed from November 14 through November 22, 1994. Subsurface gas collection was performed using a truck-mounted probe which was hydraulically advanced to depths of 1.5 to 2.0 feet below grade. Soil gas samples were then extracted from the probe for analysis with the on-site mobile laboratory. After each sample was collected, all obvious solids were removed from the probe. Decontamination was performed using a solution of potable water and a Alconox™ detergent followed by a deionized water rinse.

Each subsurface gas sample collected by the probe was analyzed for two groups of VOCs, BTEX and the six chlorinated VOCs previously discussed. Two separate samples were collected simultaneously at each location with two syringes. Duplicate samples were collected at SG-12, 32, 60, 82, 103, 124, 154, 178, and 214. All samples were analyzed immediately following collection in Plains' mobile laboratory van. BTEX compounds were analyzed using a photo-ionization detector (PID) and portable GC. Chlorinated VOCs (TCE, 1,1,1 TCA, PCE, 1,1 DCA, 1,1 DCE, and c-1,2 DCE) were analyzed using an electron capture detector (ECD) and a dedicated GC. For all analyses, periodic background samples of ambient site air were collected and analyzed to assess background air quality and confirm that the sampling equipment was properly decontaminated. All calibrations as required by the RFI Workplan were performed. QA/QC documentation is included in the laboratory report in Appendix F.

### 3.6.1.1 Subsurface Gas Sampling Analytical Results

Subsurface soil gas samples were analyzed in the field and included analyses for BTEX and TCE, 1,1,1 TCA, PCE, 1,1 DCA, 1,1 DCE, and c-1,2 DCE. The analytical results are included as Table 3-1. The laboratory analytical results and data validation summary report are included in Appendix F. All data are reported by Plains as not detected (ND) if instrument response was below reporting limits. Samples SG-36, 163, and 216 had identifiable peaks but at concentrations determined to be below the reporting limits. Those samples with detectable concentrations of the target VOCs include SG-43, 126, 209, 211, 215, 216, 217, 218, 231, and 232. The analytical results for these ten (10) sampling locations are included on Figure 3-3.

Benzene and toluene were detected at SG-43 at concentrations of 0.1 and 0.2 ug/L, respectively. Sample location SG-126 had a PCE concentration of 0.04 ug/L. SG-209 had concentrations of TCE at 0.03 ug/L and PCE at 0.02 ug/L. SG-211, 215, 217, 218, 231, and 232 all had concentrations of 1,1,1 TCA reported at 0.04, 0.02, 0.02, 0.07, 0.01, and 0.02 ug/L, respectively. The sample for SG-216 had a concentration of c-1,2 DCE of 0.17 ug/L. The

remaining samples had no detectable concentrations of the target compounds. The occurrence of soil gas survey detections were infrequent (8 of 234 sites) and at exceedingly low concentrations, especially for the chlorinated solvents. The results were used to guide the selection of locations for subsequent sampling and analysis of native soil samples underlying SWMUs #1 and #2 as described in Section 4.1.2.1.

### 3.6.2 Waste Sampling and Analyses/SWMU #1 and SWMU #2

Waste sampling for SWMUs #1 and 2 consisted of sampling each known type of waste material (as described in Section 3.4), analyzing the samples for total inorganic hazardous waste (Appendix IX) constituents, fluoride, and Toxicity Characteristic Leaching Procedure (TCLP) metals. Since organic Appendix IX hazardous waste constituents were not utilized in the foundry processes generating the wastes, Appendix IX organic constituents were not included in the foundry waste characterization program. Waste sample characterization for SWMUs #1 and #2 was performed as part of the RFI to evaluate leaching potential of the wastes for risk assessment (if needed) and to evaluate the composition and leaching potential of the wastes for use in waste treatability studies as part of a potential Corrective Measures Study (CMS).

#### 3.6.2.1 SWMUs #1 and #2 Waste Sampling Procedures

A total of thirty discrete samples (WG-8 through WG-37) were collected from the ten visually distinguishable waste types by Geraghty & Miller on February 28 and March 1, 1995. Three samples of each of the ten distinguishable waste types were collected. Approximate sample locations were selected at random and located on a gridded location map. Final sample locations were then selected based on the nearest location of one of the ten distinguishable waste types. This random sample location methodology was not used for the yellow coated, black and dark green glassy slag (Sample ID #s 17,18,19) because this waste type is not prevalent and is found in relatively small distinct piles.

Waste samples were collected using a decontaminated, stainless steel scoop. Decontamination procedures are described in Section 4.1.1.4.1. Samples were collected from the surface to depths of 6 inches below grade at each location and placed into 4-liter plastic containers supplied by the laboratory. An equipment rinsate blank was collected prior to collecting a sample at WG-20 on March 1, 1995. Laboratory grade deionized water was poured over the stainless steel sample collection spoon and collected in a 1-liter plastic bottle. This equipment blank water sample was submitted for total metals analyses. All sample containers were labeled with sample identification, date and time of collection, and analysis to be performed. The waste samples were shipped to ASARCO Technical Services (Asarco), Salt Lake City, Utah for next day delivery. The equipment blank was shipped to Quanterra, North Canto, Ohio.

The three samples from each distinguishable waste type were composited into one sample. Asarco performed the drying of samples, particle-size reduction, and compositing. Compositing was accomplished by crushing and thoroughly mixing equal portions (by weight) of each sample. In addition, Asarco also performed extraction of the total metals samples. The digestates for total metals and the residual sample aliquots of solids were then shipped to Quanterra Environmental Services laboratory in North Canton, Ohio for TCLP metals, total metals, fluoride, and total cyanide analyses. Asarco completed the sample preparation on May 26, 1995 and Quanterra received the prepared samples on May 31, 1995.

### 3.6.2.2 SWMUs #1 and #2 Waste Sampling Analyses

Waste sample analysis was performed on the Asarco prepared digestates and aliquots by Quanterra. Total metals were analyzed using USEPA SW846 Method 6010A. Boric acid was added to the total metals samples in the laboratory to neutralize the hydrofluoric acid used during the digestion process at Asarco. TCLP extraction was performed by USEPA SW846 Method 1311. Fluoride and cyanide (total) were analyzed by Methods for Chemical Analysis of Water and Waste

(MCAWW) Method 340.2 and USEPA SW846 Method 9012, respectively. Methodologies for specific metals are included in the laboratory analytical report. The analytical results for total metals, fluoride, and total cyanide in the equipment blank and waste samples are summarized on Table 3-2. The analytical results for TCLP metals are summarized on Table 3-3. The laboratory analytical results and chain-of-custody documentation as well as the data validation summary reports are included as Appendix G.

3.6.2.2.1 Analysis for Total Metals, Fluoride and Cyanide (Total)

The results for total metals, fluoride, and cyanide (total) in the 10 composite samples collected from SWMUs #1 and 2, two laboratory duplicate samples (WG-11,12,13 and WG-32,33,34), and the equipment blank are included as Table 3-2 with corresponding waste grab sample locations included on Figure 3-2. Two laboratory control samples (LCS) were included for analysis with this sample group. LCS percent recovery for arsenic, cadmium, copper, nickel, selenium, zinc, barium, thallium, and vanadium were outside acceptance criteria. Therefore, sample data associated with these quality assurance (QA) results are qualified as estimated (J) (Appendix G). No metals were detected in the equipment rinsate blank. Additionally, the results for the two samples that had laboratory duplicate analyses performed indicate that the concentrations, for practical purposes of characterization, are the same. This agreement gives a high degree of confidence in the precision of the results.

Each composite waste sample contained reportable quantities of all 17 metals included in the total metals analysis with the exception of mercury and thallium. As discussed above, the analytical results for arsenic, cadmium, copper, nickel, selenium, zinc, barium, thallium, and vanadium were estimated based on data validation. Mercury was detected in only five of the composite samples at concentrations ranging from 0.27 mg/kg at WG-21,22,23 to 11.4 mg/kg in the duplicate sample for WG-32,33,34. Thallium was detected in only one sample, WG-32,33,34, at a concentration of 24.9 mg/kg. Silver concentrations range from 1.1 mg/kg in WG-17,18,19 to

27.1 mg/kg in WG-23,24,25. Barium was detected at concentrations ranging from 75.0 mg/kg at WG-23,24,25 to 5,000 mg/kg at WG-29,30,31. Beryllium concentrations range from 3.1 to 199 mg/kg at WG-8,9,10 and WG-14,15,16, respectively. Concentrations of cadmium range from 2.5 mg/kg at WG-17,18,19 to 1,410 mg/kg in the duplicate sample for WG-32,33,34. Cobalt was detected at concentrations ranging from 7.3 mg/kg at WG-32,33,34 to 97.7 mg/kg at WG-14,15,16. Chromium concentrations range from 92.2 to 4,620 mg/kg at WG-23,24,25 and WG-14,15,16, respectively. Concentrations of total copper range from 223 mg/kg at WG-17,18,19 to 52,100 mg/kg at WG-35,36,37. Total nickel ranges from 56.8 to 927 mg/kg at WG-26,27,28 and WG-14,15,16, respectively. Antimony was detected at concentrations ranging from 51.2 at WG-8,9,10 to 4,750 mg/kg at WG-29,30,31. Concentrations of vanadium range from 12.0 to 213 mg/kg at WG-23,24,25 and WG-8,9,10. Zinc ranges from concentrations of 1,060 mg/kg at WG-8,9,10 to 480,000 mg/kg at WG-23,24,25. Arsenic concentrations range from 3.0 mg/kg at WG-14,15,16 to 386 mg/kg at WG-26,27,28. Arsenic analysis was not performed for the duplicate sample collected for WG-11,12,13. Lead was detected at concentrations ranging from 1,780 to 122,000 mg/kg at WG-20,21,22 and the duplicate sample for WG-32,33,34, respectively. Concentrations of selenium range from 0.86 mg/kg at WG-17,18,19 to 91.4 mg/kg at WG-8,9,10. Analysis for selenium was not performed for the duplicate sample collected at WG-11,12,13. Concentrations of tin range from 231 mg/kg at WG-8,9,10 to 40,400 mg/kg at WG-32,33,34.

Fluoride was detected in all composite samples. Concentrations of fluoride range from 30 mg/kg in WG-8,9,10 to 17,000 mg/kg in the duplicate sample collected at WG-11,12,13. Cyanide (total) was detected only at WG-20,21,22 at a concentration of 0.42 mg/kg.

The analytical results for total metals and fluoride show a high variability between types of waste. For example, total lead exceeded 99,000 mg/kg in two waste types (gray slag and bluish gray powdery slag, and light gray powder) but was below 9,000 mg/kg for four waste types. Also, total cadmium exceeded 400 mg/kg in the same two waste types that had the highest lead

concentrations and also in a dark gray and black powdery, sandy, granular slag, but was less than 20 mg/kg in six waste types, including all four of the waste types where total lead was below 9,000 mg/kg. In contrast to lead and cadmium, the variability of total arsenic is relatively small. The results, however, show a high variability between waste types for most metals.

Highest concentrations of lead and cadmium were detected in the bluish gray powdery slag and light gray powder. Since these materials are fine-grained, they can easily infill the larger particles of the other waste types. It is this infilling which probably explains the exceedances of standards for TCLP for lead and cadmium that were found by ATEC in October 1988 (ATEC, 1988) for vertical channel samples collected at SWMU #1. The distribution of fine particulate wastes containing high lead and cadmium concentrations will make the "surgical removal" of these two waste types from SWMU #1 practically impossible.

3.6.2.2.2 Analysis for TCLP Metals

TCLP analysis for metals included silver, arsenic, barium, cadmium, chromium, lead, selenium, and mercury. Analysis was performed for all 10 composite samples collected from SWMUs #1 and 2. The analytical results are included on Table 3-3. Sample locations are shown on Figure 3-2. Silver, arsenic, chromium, selenium, and mercury were not detected in any of the composite samples. TCLP concentrations of barium, where detected, range from 1.1 mg/L in WG-11,12,13 to 3.1 mg/L at WG-32,33,34. Cadmium was detected in composite samples WG-20,21,22, WG-23,24,25, WG-32,33,34, the duplicate sample for WG-32,33,34, and WG-35,36,37. Where detected, concentrations of cadmium range from 0.27 mg/L at WG-20,21,22 to 9.8 mg/L at WG-23,24,25. TCLP lead concentrations were detected in all samples except WG-8,9,10, WG-11,12,13 (including the duplicate for this sample), and WG-26,27,28. Where detected, lead concentrations range from 0.36 mg/L at WG-17,18,19 to 78.4 mg/L at WG-32,33,34.

Barium, cadmium, and lead were the only TCLP metals detected in composite samples collected from the landfill waste types (Table 3-3). The maximum concentration regulatory levels established for these three metals for the toxicity characteristic are as follows: barium, 100 mg/L, cadmium, 1.0 mg/L, and lead, 5.0 mg/L. None of the waste types where barium was detected exceed the regulatory limit for this metal. Composite samples WG-23,24,25, WG-32,33,34 (including the duplicate for this sample), and WG-35,36,37 exceed the regulatory limit for cadmium. Those waste types which exceed the regulatory limit for lead are WG-20,21,22, WG-23,24,25, WG-32,33,34 (including the duplicate for this sample), and WG-35,36,37.

Those waste types with TCLP exceedances were the three wastes mentioned previously as having elevated concentrations of total lead and/or cadmium (gray slag and bluish gray powdery slag, light gray powder, and dark gray and black powdery, sandy, granular slag) and the pumice like, light gray to black (WG-20,21,22) waste type. Only the pumice-like light gray to black waste material showed an exceedance for TCLP lead from a waste type that had relatively low concentrations of total lead (1,780 mg/kg). It is significant that the pumice-like light gray to black waste type is one that can form exceedingly fine particles, helping to explain the exceedance.

The waste types which exceeded established regulatory levels for toxicity characteristic and therefore classified as hazardous for cadmium and/or lead were the pumice like, light gray to black waste (WG-20,21,22), the gray slag and bluish gray powdery slag (WG-23,24,25), the light gray powder which had an appearance similar to baghouse dust (WG-32,33,34), and the dark gray and black, powdery, sandy, granular slag (WG-35,36,37). Only the pumice-like waste did not have a particularly high total metal content. A common characteristic of these wastes types is that they consist of fine particulates or are capable of being easily reduced to fine particles.

## 3.7 WASTE CHARACTERIZATION/SWMU #8

Waste sample characterization for SWMU #8 consisted of analyzing the samples for total metals and TCLP metals (eight RCRA metals). These analyses were performed to classify the waste (hazardous or non-hazardous) and to assess the composition of the dusts in the event that they are found in contact with soil beneath SWMU #8.

### 3.7.1 SWMU #8 Waste Sampling Procedures

A total of seven discrete samples (WG-1 through WG-7) were collected from SWMU #8 by Geraghty & Miller on January 3, 1995. An arbitrary grid was established for the main baghouse and sample locations WG-1 through WG-6 were selected at random. Waste samples from the main baghouse were collected using a decontaminated, stainless steel scoop. Samples were collected from the surface of the concrete floor at each location in the main baghouse. WG-7 was collected from one of four piles located at the adjacent small baghouse. This sample was collected using a decontaminated stainless steel shovel. Decontamination procedures for sampling equipment are described in Section 4.1.1.4.1. An equipment rinsate blank was collected following sampling at WG-7. Laboratory grade deionized water was poured over the stainless steel spoon and collected in a 1-liter plastic bottle. This equipment blank water sample was submitted for total metals analyses. All grab waste samples were placed into 1-liter plastic containers supplied by the laboratory. Each sample container was labeled with sample identification, date and time of collection, and analysis to be performed. Waste grab samples were shipped to Asarco for next day delivery. The equipment blank was shipped to Quanterra, North Canto, Ohio.

Asarco performed the drying of samples, particle-size reduction, and compositing. Compositing was performed for WG-1, 2, and 3 as well as WG-4, 5, and 6 by crushing and thoroughly mixing equal portions (by weight) of each sample. Once this was completed, remaining sample material not prepared for total metals analyses was shipped to Quanterra for TCLP metals

and total mercury analyses. Asarco performed digestion and preparation of extraction of the total metals samples (excluding mercury). Preparation of the digestates for total metals and residual solid sample aliquots were completed at Asarco on January 23, 1995 and samples were shipped to Quanterra Environmental Services laboratory in North Canton, Ohio for TCLP metals and total metals analyses. Quanterra received the samples from Asarco on January 24, 1995.

### 3.7.2 SWMU #8 Waste Sampling Analyses

Waste sample analysis was performed on the Asarco prepared digestates and aliquots by Quanterra. Total metals analysis included silver, barium, cadmium, chromium, lead, mercury, and selenium by USEPA SW846 Method 6010A. TCLP extraction was performed by USEPA SW846 Method 1311 for the same eight metals. Methodologies for specific metals are included in the laboratory analytical report. The analytical results for total metals are summarized on Table 3-4. The analytical results for TCLP metals are summarized on Table 3-5. The laboratory analytical results and chain-of-custody documentation as well as the data validation summary reports are included as Appendix G.

#### 3.7.2.1 Analysis for Total Metals

The results for total metals in the equipment blank, the two composited samples collected from the main baghouse (WG-1,2,3 and WG-4,5,6), the sample collected from the small adjacent baghouse (WG-7), as well as the results for laboratory duplicates performed on all three waste samples are included as Table 3-4. Corresponding waste grab sample locations are included on Figure 3-2.

The two composite samples collected from the main baghouse contained reportable quantities of all 8 metals included in the total metals analysis. Based on data validation, all concentrations are qualified as estimated based on dilution of the samples prior to analysis

(Appendix G). Sample WG-7 did not contain reportable concentrations of silver and only the laboratory duplicate for this sample contained a reportable concentration for selenium. Mercury analysis was not performed in the laboratory duplicate analyses. The laboratory duplicate analytical results for total metals (excluding mercury) show a close comparison with the sample results. Metals were not detected in the equipment blank.

Concentrations of silver, barium, and cadmium in WG-1,2,3 and WG-4,5,6 were estimated at 13.8 and 10.2 mg/kg, 356 and 384 mg/kg, and 1,480 and 871 mg/kg, respectively. Estimated concentrations for total chromium, arsenic, and lead in these two composite samples were 66.4 and 393 mg/kg, 693 and 393 mg/kg, and 54,200 and 64,600 mg/kg, respectively. Mercury and selenium were detected in WG-1,2,3 and WG-4,5,6 at estimated concentrations of 88.0 and 88.2 mg/kg, and 389 and 11.3 mg/kg, respectively. Estimated concentrations of barium, cadmium, chromium, arsenic, lead, and mercury in the sample collected at WG-7 were 20.6, 463, 27.2, 16.0, 6,070, and 0.37 mg/kg, respectively. There is apparent similarity when comparing these results to those SWMU #1 waste types described as bluish gray powdery slag and light gray powder, which were found to be high in the same metals, notably lead and cadmium.

### 3.7.2.2 Analysis for TCLP Metals

The results for TCLP analysis for silver, barium, cadmium, chromium, arsenic, lead, mercury, and selenium are included as Table 3-5. Silver, barium, chromium, arsenic, and selenium were not detected in any of the waste grab samples at SWMU #8. Mercury was only detected in the composite sample WG-4,5,6 at a concentration of 0.023 mg/L. Cadmium and lead were detected in all three waste samples. Estimated concentrations of cadmium and lead in the main baghouse samples (WG-1,2,3 and WG-4,5,6) were 33.4 and 10.8 mg/L, and 179 and 122 mg/L, respectively. The TCLP cadmium concentration detected in the adjacent small baghouse (WG-7) sample was 5.0 mg/L. The lead concentration in this sample was 6.6 mg/L.

Cadmium, lead, and mercury were the only TCLP metals detected in waste samples collected from SWMU #8 (Table 3-4). The maximum concentration regulatory levels established for cadmium and lead, as previously discussed in Section 3.6.2.2.2, are 1.0 and 5.0 mg/L, respectively. The regulatory level established for mercury is 0.2 mg/L. Only sample WG-4,5,6 detected mercury, at a concentration of 0.023 mg/L. This concentration is below the regulatory level. All three waste samples collected from SWMU #8 meet or exceed the regulatory limits for both cadmium and lead and are therefore classified as hazardous.

## 3.8 SUMMARY OF WASTE CHARACTERIZATION

For SWMUs #1 and #2, the concentrations of total metals in some of the metals processing waste material are elevated relative to agricultural soils, specifically for lead, cadmium, mercury, zinc, and copper. TCLP results of these same samples show only lead and cadmium meet or exceed the regulatory limits. However, it is evident from the soil, groundwater, lake sediment and lake water analytical results for samples collected beneath and adjacent to SWMUs #1 and #2, that metals, other than those that failed TCLP, have impacted the environment. The likely source for these impacts are the metal processing waste of SWMUs #1 and #2. As part of the corrective measures for the site, prevention from further leaching to the environment of SWMUs #1 and #2 will be required. Alternatives for the prevention of further leaching will be detailed in the Corrective Measures Study (CMS).

The materials from the main bag house (SWMU #8), are characteristically similar to some waste types on SWMU #1, the landfill. The waste material in the bag house may be the source of the powdery wastes at WG-23,24,25 and at WG-32,33,34 on SWMU #1. Performing a selective removal of the powdery materials in SWMU #1 would be practically impossible. As part of the corrective measures for the site, removal of waste material at SWMU #8 will be required.

Alternatives for waste removal at SWMU #8 will be detailed in the Corrective Measures Study (CMS).

# 4.0 RELEASE CHARACTERIZATION

Subsurface soils, groundwater, surface water and lake sediment at and adjacent to identified SWMUs were investigated to identify whether releases have affected these media, and where applicable, to evaluate the extent of any releases. SWMU locations are shown in Site Plan (Figure 3-1). A detailed description of SWMUs at the site and the information sources used to determine the nature and location of the SWMUs is provided in the Task 1 report (Geraghty & Miller, 1992) and summarized above in Section 3.0. SWMUs at the Federated site are summarized below:

SWMU #1 - The landfill outside the fenced area, presently containing various slags and related foundry wastes.

SWMU #2 - All waste slag materials presently located within the fenced area.

SWMU #3 - All areas within the fenced-in area formerly used to store foundry wastes (as documented by file evidence).

SWMU #4 - A waste hauler storage area formerly used to store used baghouse bags, in addition to wood and paper. The baghouse bags may have contained tin/lead fume and/or zinc fume.

SWMU #5 - Former zinc sludge drum storage area.

SWMU #6 - Former zinc sludge pile storage area.

SWMU #7 - Former light iron storage area.

SWMU #8 - Former main baghouse and small adjacent baghouse.

SWMU #9 - Former used oil underground storage tanks (UST) - capacity of at least 1100 gallons.

SWMU #10 - Solvent (chlorothene) evaporation area.

## 4.1 SOILS

Soil sampling was performed as part of the RFI scope of work to determine if hazardous waste (Appendix IX) constituents have been released into native soils beneath identified SWMUs at the site. The soil sampling procedures and analytical results are summarized below with respect to background sampling as well as the identified SWMUs. On-site soil sampling locations are included on Figure 4-1. Background soil sample locations are shown on Figure 4-2.

### 4.1.1 Background Soil Sampling

Three soil samples were collected to determine background concentrations of Appendix IX organics and inorganics plus fluoride and total cyanide in soil near the site. These samples were collected at Eggers Woods, a forest preserve located slightly less than 2 miles northwest of the Federated site. Eggers Woods was selected as the background sampling site because it is near a wetland in a setting similar to the former natural (pre-development) setting of the Federated site. The location of Eggers Woods with respect to the Federated site and the background soil sampling locations BG-1, BG-2 and BG-3 are shown on Figure 4-2.

The samples were collected at depths ranging from 6 to 18 inches below the ground surface. Soil encountered at the background locations was fine to coarse mostly quartz sand with 20 to 40%

gravel. Some silty black organic material was also observed in the samples. The samples were taken in areas judged to be undisturbed; an area within the preserve formerly containing a Nike missile base (U.S. military) was avoided. Sample locations were distributed to represent potential spatial variability and were greater than 200 feet from traffic-bearing roads. A duplicate sample and additional sample volume for matrix spike/matrix spike duplicate (MS/MSD) analyses were also collected. The samples were analyzed for the Appendix IX inorganics plus fluoride and total cyanide, VOCs, and semi-volatile organic compounds (SVOCs).

Since all of the organic compounds were reported below the detection limit (BDL), the focus of the background evaluation was for the inorganic data. Data was collected for silver, barium, beryllium, cadmium, cobalt, chromium, copper, nickel, antimony, vanadium, zinc, arsenic, lead, mercury, selenium, thallium, tin, fluoride, and total cyanide. Of these compounds, only barium, cobalt, chromium, copper, nickel, vanadium, zinc, arsenic, lead, and fluoride were detected in the background samples. Therefore, formal statistical evaluations could only be performed for these 10 compounds. In the instance of a non-detected value, a value equal to one-half of the detection limit was used in the calculations. In addition, where duplicate samples were collected from the same boring, the two values were averaged.

#### 4.1.1.1 Comparisons Where All Background Data is BDL

Background data for silver, beryllium, cadmium, antimony, mercury, selenium, thallium, tin, and total cyanide were reported as entirely BDL Since there are so few background data points and since each of the background points are BDL, an on-site sample will be determined to be significantly different from background if it exceeds two times the detection limit. The following table lists the lowest detection limit and indicates whether there are any on-site data points that exceed twice that value.

| Compound | Detection Limit | Exceedances? |
|---|---|---|
| Silver | 1.0 | Yes |
| Beryllium | 0.50 | Yes |
| **Compound** | **Detection Limit** | **Exceedances?** |
| Cadmium | 1.0 | Yes |
| Antimony | 30.0 | Yes |
| Mercury | 0.10 | Yes |
| Selenium | 0.50 | Yes |
| Thallium | 1.0 | No |
| Tin | 100 | Yes |
| Total Cyanide | 0.28 | No |

#### 4.1.1.2 Upper Confidence Limit Calculation

Prior to performing any statistical evaluations, a normality test was performed on the Background data set (collected from borings BG-1, BG-2, and BG-3) for the 10 compounds where there were reported concentrations in the background samples. Because of the very limited number of points in the background data set, the results of any statistical test are not very robust. However, a coefficient of variation was calculated and a Kolmogorov-Smirnov test for normality was performed. The background data was determined to come from a normal distribution. In accordance with the Work Plan, a confidence interval was calculated. The following table gives the Upper Confidence Limit (UCL) of the 10 compounds and whether there were any on-site data which exceed that limit.

| COMPOUND | UCL | On-Site Exceedances? |
|---|---|---|
| Barium | 22.4 | Yes |
| Cobalt | 12.1 | Yes |
| Chromium | 18.9 | Yes |
| Copper | 8.5 | Yes |
| Nickel | 12.4 | Yes |
| Vanadium | 16.5 | Yes |
| Zinc | 27.3 | Yes |
| Arsenic | 14.7 | Yes |
| Lead | 11.5 | Yes |
| Fluoride | 78 | Yes |

The confidence interval constructed on the background data set is designed to contain the mean concentration of the background data set with 95% confidence. Therefore, the confidence interval will fail to include the true mean in approximately 5% of the cases. The upper confidence limit is not meant to be an upper limit of acceptable background concentrations of a compound. This means that it is possible for 5% of actual background data to fall outside of the confidence limit.

#### 4.1.1.3 Comparisons Between Two Groups

A parametric t-test or a non-parametric Wilcoxon Rank-Sum Test (Mann-Whitney U Test) are more appropriate to determine whether a significant difference exists between background and on-site data. However, because of the limited background data set, these two tests may not provide valid results. Nonetheless, these tests were performed since this is the only data that was available.

In order to choose between a t-test or a Wilcoxon Rank-Sum Test, a Shapiro-Wilk Test for Normality and Levene's test for homogeneity of variances were performed on each of the ten data sets. If a data set was determined to be either normally or lognormally distributed and the variances were approximately equal, a t-test was performed. (In the case of a lognormal data set, the tests were performed on the natural logs of the actual data.) If a data set was not normally or lognormally distributed or if the variances were unequal, a Wilcoxon Rank-Sum test was performed. The following table summarizes the results of the Shapiro-Wilk and Levene's tests; describes the test chosen (t-test or Wilcoxon Rank-Sum); and indicates whether a significant difference (95%) exists between background and on-site data.

| Compound | Are the data normally or lognormally distributed and are the variances equal? | Test Performed | Significant Difference? |
|---|---|---|---|
| Barium | No | Wilcoxon Rank-Sum | No |
| Cobalt | No | Wilcoxon Rank-Sum | No |
| Chromium | No | Wilcoxon Rank-Sum | No |
| **Copper** | No | Wilcoxon Rank-Sum | Yes |
| Nickel | No | Wilcoxon Rank-Sum | No |
| Vanadium | Lognormal and variances equal. | t-test | No |
| **Zinc** | Lognormal and variances unequal. | Wilcoxon Rank-Sum | Yes |
| Arsenic | No | Wilcoxon Rank-Sum | No |
| Lead | No | Wilcoxon Rank-Sum | No |
| Fluoride | No | Wilcoxon Rank-Sum | No |

In view of the limited background data set, the results of the background to on-site data comparisons may not be reliable. Nonetheless, there appears to be evidence that suggests that the on-site data may exceed background levels for zinc and copper. However, due to the limited size of the background data set, it is difficult to ascertain whether the exceedances are due to site activities or due to the natural heterogeneity of the soils in the area of the Federated site.

As a conservative approach, background levels were regarded as having been exceeded by the Federated soil sample concentrations if the concentration of a constituent exceeded the 95%

UCL on the mean. The 95% UCLs on the means for barium, cobalt, chromium, copper, nickel, vanadium, zinc, arsenic, lead, and fluoride are indicated on Table 4-1. Concentrations of metals detected at the Federated site which exceed the 95% UCL on the mean for a given metal are also indicated on Table 4-1.

#### 4.1.1.4 Background Soil Sampling Procedure

##### 4.1.1.4.1 Decontamination

A stainless steel hand auger, stainless steel bowl, and stainless steel scoop were used to collect the background soil samples. Prior to sample collection at each location, all equipment was decontaminated. In addition, the auger head was decontaminated immediately before collecting the soil sample from the planned sampling depth. Disposable gloves were worn and changed frequently while the equipment was cleaned to avoid contamination. The procedure for cleaning the sampling equipment prior to collecting a sample for chemical analysis was as follows:

1. A two percent solution of Alconox and distilled water was prepared in a bucket. A distilled water rinse was prepared in another bucket. Laboratory grade deionized water was poured into a clean (pre-rinsed with deionized water) spray bottle.

2. The hand auger (disassembled), bowl and scoop were immersed in the Alconox solution.

3. All equipment was scrubbed with a brush to remove any adhering particles.

4. All equipment was then rinsed with potable water, followed by thorough rinsing with deionized water.

5. Clean equipment was reassembled (if necessary) and placed on a clean polyethylene sheet if not immediately used.

4.1.1.4.2 Sample Collection

New disposable latex gloves were worn during sample collection. All samples were collected with a hand auger. The stainless steel scoop was used to remove the sample from the auger head when necessary and the sample was contained in the stainless steel bowl. Soil was placed in the appropriate laboratory containers using the same stainless steel scoop. Soil samples for VOCs analysis were collected first at each location using the scoop to pack soil tightly into the sample container to minimize headspace. Care was taken to insure that only the stainless steel scoop touched the soil during sample collection. All sample containers were labeled with the sample identification, date and time of collection, and analysis to be performed. The label was affixed to the sample using a sample tag. Samples were immediately placed on ice in the laboratory provided cooler.

A portion of each soil sample was described in the field. Collection depth, Munsell color, estimated texture (percent sand, silt and clay), odor and staining (if any), moisture or saturation conditions, organic content (if any) and estimated mineral composition (for sand size and larger particles) were recorded in the field book. The exact sample location was also recorded using north-south and east-west measured distances from a fixed point.

The soil samples collected at locations BG-1, BG-2 and BG-3 were collected from respective depths of 12 to 18, 6 to 12, and 10 to 16 inches below the surface. A duplicate sample for each parameter was collected from location BG-2 and was designated as location BG-4. MS/MSD analyses were performed for the sample collected at BG-1. Additional sample volume

was collected for SVOCs to facilitate MS/MSD analyses. All samples were submitted under proper chain-of-custody and sample preservation procedures to Quanterra, North Canton, Ohio.

An equipment blank (FMGWMWC) was collected following sampling at BG-3. Equipment was decontaminated as outlined in Section 4.1.1.4.1. The laboratory deionized water was then poured through the auger head over the shovel and collected in the bowl. The water was then poured from the bowl directly into the appropriate sample containers provided by the laboratory for analysis of VOCs, SVOCs and Appendix IX Inorganics plus fluoride and total cyanide. Necessary preservatives were added immediately after sample collection. The equipment blank was designated FMGWMWC and shipped under proper chain-of-custody and sample preservation procedures to the laboratory.

4.1.1.4.3 Background Soil Sampling Results

The laboratory analytical results and chain-of-custody documentation as well as the data validation summary reports are included as Appendix H. The analytical data for the near surface background soil sampling is summarized on Table 4-2. VOCs and SVOCs were not detected in any of the background soil samples. Appendix IX Metals detected in all three background samples include barium, cobalt, chromium, copper, nickel, vanadium, zinc, arsenic, and lead. Though not detected, matrix spike recoveries and or post-digestion spike recoveries for antimony, selenium, and thallium in sample BG-1 were below established control limits. Therefore, non-detect results for these metals are qualified as estimated (Appendix H). The average mean concentration for each detected parameter is 12.7, 10.4, 12.2, 4.5, 7.5, 9.3, 23.5, 2.9, and 7.9 mg/kg, respectively.

The analytical results for fluoride and total cyanide are also included on Table 4-2. Based on data validation results, the initial calibration criteria for both fluoride and cyanide were not met, therefore, the results are qualified as estimated (Appendix H). Fluoride was detected in samples collected at BG-1, BG-2, and BG-3, but not in the duplicate sample for BG-2. Assuming the

concentration of fluoride in the duplicate sample is zero, the average mean concentration calculated for fluoride is 26.8 mg/kg. Total cyanide was not detected in the background soil samples.

No other Appendix IX compounds were detected in the background samples. The background soil samples have low levels of metals and fluoride which are consistent with background concentrations associated with fine-grained sands.

Analytical results for the equipment blank are summarized on Table 4-2. The laboratory analytical results and chain-of-custody documentation as well as the data validation summary reports are included as Appendix H. Results indicate that only acetone was detected at an estimated (below the practical quantitation limit) concentration of 16 ug/L in the equipment blank. Since acetone was also detected in the method blank, acetone was qualified as not detected during data validation (Appendix H).

### 4.1.2 Soil Sampling/SWMUs #1 Through #10 and Comparison to Background

All soil samples from beneath SWMUs #1 through #10 were collected from a depth of 6 to 12 inches below the top of native soil. This sample depth was specified in the RFI Workplan to avoid biasing the results due to the possible inclusion of minor waste or other foreign particles from the overlying fill. Soil was judged "native" if it did not appear to contain particles of waste material and was not a non-native fill material (e.g. cinders, crushed stone, bricks, etc.). Generally, the native soils encountered consisted of sand, sand and subrounded gravel, or a mixture of sand and dark-colored organic material.

With respect to SWMUs #1 and #2, the number and locations of soil samples, and parameters analyzed were selected by Geraghty & Miller (representing Federated Metals) and the USEPA based on the results of the soil gas survey (Section 3.6.1) and the waste characterization sampling (Section 3.6). Soil sample locations and parameters analyzed at SWMUs #3 through #10

were outlined in the RFI workplan. All on-site soil sampling locations are shown on Figure 4-1. All soil cuttings generated with the drilling rig during sampling were placed in 55-gallon drums, labeled with the appropriate drilling location, dated, and staged within the fenced landfill area adjacent to the decontamination pad. Additional details for disposal of cuttings are discussed in Section 4.2.2.3.

Samples collected from SWMUs #1 and #2 were analyzed for VOCs, SVOCs, Appendix IX Inorganics, plus fluoride and total cyanide. All samples collected from SWMU #3, excluding NS16 (6.5-7 feet) and NS14 (4.5-5 feet), were analyzed for the Appendix IX inorganics plus fluoride. In addition, five samples collected at randomly selected locations in this SWMU were also analyzed for VOCs and SVOCs. The seven soil samples collected from beneath SWMUs #4, #5, #6, and #7 were analyzed for the Appendix IX inorganics plus fluoride. No soil samples were collected beneath SWMU #8 since the main baghouse floor consists of a cement slab that appears to be in good shape. Soil samples collected at SWMU #9 were analyzed for VOCs, SVOCs and Appendix IX Inorganics plus fluoride. Samples collected at SWMU #10 were analyzed for Appendix IX metals plus fluoride, VOCs, and SVOCs.

The 95% upper confidence limit (UCL) on the mean of the background samples was calculated for all detected constituents (metals and fluoride). Background levels were regarded as having been exceeded in soil samples if the concentration of a constituent exceeds the 95% UCL on the mean or, in the case where constituents were not detected in the background samples (BDL), on-site data was considered to be significantly different from background if it exceeds two times the detection limit. Constituents which exceed background are included in the analytical results discussion for each SWMU.

#### 4.1.2.1 SWMU #1 and #2 Soil Sampling

SWMU #1 consists of the landfill outside the fenced area and contains various slags and related foundry wastes. SWMU #2 also contains waste slag materials but is located within the fenced area. Ten near surface soil samples were collected from beneath these SWMUs. The locations of SWMUs #1 and #2 as well as the sampling locations, designated NS-37 through NS-46, are shown on Figure 4-1. Soil samples were collected at depths ranging from 1 to 9.5 feet below the surface. The samples were collected from a depth of 6 to 12 inches below the top of native soil and were analyzed for VOCs, SVOCs, Appendix IX Inorganics plus fluoride. Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed on the sample collected from NS-46. A duplicate sample was collected from location NS-42. After sampling at location NS-44, an equipment blank (FMGWMWH) was collected and analyzed for VOCs, SVOCs, Appendix IX Inorganics, plus fluoride and total cyanide. Because of the presence of large slag and concrete debris, a backhoe was used to remove any overlying waste material at each sampling location.

##### 4.1.2.1.1 SWMUs #1 and #2 Soil Sampling Procedure

Soil samples were collected at each location using a decontaminated backhoe to dig a trench in the foundry waste material until native soils were reached. The backhoe was steam cleaned at the on-site decontamination pad prior to mobilization to each location. Small volumes of soil were removed with the backhoe bucket as each sample excavation approached the contact between the overlying fill material and native soil. Grab samples were examined and the approximate depth of native sediment was determined. The bucket of the backhoe was not decontaminated immediately prior to collection of the soil sample; however, care was taken to only retrieve a sample from the middle portion of a large scoop of soil which did not come into contact with the backhoe bucket. Following completion of sampling activities at each location, the excavation was backfilled.

Samples were collected with a stainless steel scoop directly from the soil within the backhoe bucket and placed into a stainless steel bowl. The soil was then removed from the bowl with the same scoop and placed into the appropriate laboratory containers. VOC samples were collected first with soil packed tightly in the sample container to eliminate headspace. Sample handling and equipment (scoop and bowl) decontamination procedures were the same as those described in Section 4.1.1.4.1

Prior to collecting the equipment blank, the backhoe bucket was steam cleaned and the sampling equipment was decontaminated as described above. The bowl and scoop were placed into the bucket. Laboratory-grade deionized water was poured over the bowl and scoop and into the backhoe bucket. The water drained through a hole in the bottom of the bucket and collected directly into the laboratory containers. This equipment blank water sample was prepared for shipment to Quanterra as described in Section 4.1.1.4.2.

4.1.2.1.2 SWMUs #1 and #2 Soil Sampling Analytical Results

The analytical results for soils collected at SWMUs #1 and #2 are listed on Table 4-3. The laboratory analytical results, chain-of-custody documentation, and data validation summary reports are included as Appendix H. Results for VOCs, SVOCs, and metals and fluoride in soil are shown on Figures 4-3, 4-4, and 4-5, respectively.

VOCs detected in the samples from beneath SWMUs #1 and #2 are included on Figure 4-3. Acetone was detected (estimated concentrations) at soil sample locations NS-39, 40, 41, 42 (duplicate), 43, and 45. Estimated acetone concentrations range from 16 ug/kg to 31 ug/kg. Acetone is a common laboratory artifact. Methyl ethyl ketone (2-butanone) was detected in the samples collected from NS-40, NS-41, NS-42 and NS-45 but was also detected in the method blanks for these samples. Therefore, these results are qualified as non-detect. Methylene chloride was detected at all locations except NS-37 and NS-41 at concentrations ranging from 3.1 to 38

ug/kg. Toluene was detected in samples collected from locations NS-37, 40, and 42 at estimated concentrations that range from 3.0 to 5.5 ug/kg. At location NS-43, toluene was detected at a concentration of 8.7 ug/kg. In the sample collected from NS-45, concentrations of carbon disulfide (5.9 ug/kg), tetrachloroethene (37 ug/kg), trichloroethene (30 ug/kg), and 1,2-dichloroethene (40 ug/kg) were detected. Total xylenes were detected at estimated concentrations of 4.1 ug/kg and 3.5 ug/kg at locations NS-39 and NS-43, respectively. No other VOCs were detected.

Concentrations of SVOCs detected in soil samples for SWMUs #1 and #2 are included on Figure 4-4. Of the SVOCs, only di-n-octyl pthalate and pentachloroethane were detected. Reported results for both compounds were less than the detection limit and therefore, estimated. Di-n-octyl pthalate was detected only in the duplicate sample collected from location NS-42 at an estimated concentration of 120 ug/kg. Pentachloroethane was detected in the samples from NS-38, NS-42, and NS-46 at estimated concentrations of 91 ug/kg, 87 ug/kg, and 100 ug/kg, respectively. No other SVOCs were detected.

Metals detected in soil are shown on Figure 4-5. Barium, chromium, copper, zinc, arsenic, and lead were detected in all soil samples collected beneath SWMUs #1 and #2. Based on data validation, soil matrix spikes for lead and selenium were below control criteria, therefore, results for these two metals are qualified as estimated. In addition, metal data for barium at NS-37, 39, 44, and 45, beryllium at NS-45, copper at NS-39, 43, 44, and 45, and antimony at NS-45 did not meet serial dilution criteria. The respective results for these sample are qualified as estimated (Appendix H). Barium concentrations detected in the samples range from 3.5 mg/kg at NS-40 to 143 mg/kg at NS-45. Concentrations of chromium detected range from 3.7 mg/kg at NS-42 to 116 mg/kg at NS-44. Copper was detected in the samples at concentrations that range from 3.5 mg/kg at NS-46 to 4,710 mg/kg at NS-45. Zinc concentrations range from 13.0 mg/kg at NS-46 to 8,230 mg/kg at NS-45. Arsenic was detected at concentrations that range from 0.86 mg/kg at NS-42 to 28.4 mg/kg at NS-45. Lead was detected at estimated concentrations beneath SWMUs #1 and #2 ranging from

1.5 mg/kg at NS-42 to 3,230 mg/kg at NS-45. Silver (2.1 mg/kg), beryllium (17.0 mg/kg), and mercury were only detected in the sample collected from NS-45. In the samples collected at locations NS-38, NS-39, NS-44 and NS-45, concentrations of cadmium range from 5.7 to 24.8 mg/kg. Cobalt was detected at locations NS-37, NS-44 and NS-45 at respective concentrations of 9.5, 12.1, and 12.8 mg/kg. Nickel was detected at concentrations that range from 5.1 mg/kg to 87.2 mg/kg at all locations except Ns-41 and NS-46. Antimony concentrations of 41.0 mg/kg and 413 mg/kg were detected in the samples from NS-39 and NS-45, respectively. Vanadium was detected at all locations except NS-38, NS-39, and NS-46 at concentrations which range from 6.3 to 14.3 mg/kg. At locations NS-39 and NS-44, concentrations of selenium were 1.3 mg/kg and 1.8 mg/kg, respectively. Thallium was not detected in any of the samples. Tin was detected at NS-44 (208 mg/kg) and at NS-45 (2,230 mg/kg).

The results for fluoride and total cyanide are included on Table 4-3 and the results are displayed on Figure 4-5. The soil MS/MSD recoveries associated with the quality control (QC) samples were below the control criteria limits for fluoride (Appendix H). Therefore, all fluoride data is qualified as estimated. Fluoride concentrations range from not detected at NS-41 to 790 mg/kg at NS-45. Total cyanide was not detected in any of the soil samples collected beneath SWMUs 1 and 2.

4.1.2.1.3 SWMUs #1 and #2 Soil Results Compared to Background

Native soil analytical results for SWMUs #1 and #2 were compared to background. As previously discussed, the 95% upper confidence limit (UCL) on the mean of the background samples was calculated for all detected constituents. Background levels were regarded as having been exceeded in soil samples if the concentration of a constituent exceeds the 95% UCL on the mean or, in the case where constituents were BDL in the background samples, on-site data was considered to be significantly different from background if it excceeds two times the detection limit.

VOCs detected above background were methylene chloride at NS-42 (15 ug/kg), the duplicate sample for NS-42 (12 ug/kg), and NS-45 (38 ug/kg), tetrachloroethene at NS-45 (37 ug/kg), trichloroethene at NS-45 (30 ug/kg), and 1,2-dichloroethene at NS-45 (40 ug/kg). No SVOC compounds detected exceed background.

Metals exceeding background at SWMUs #1 and #2 are silver at NS-45 (2.1 mg/kg), barium at NS-39 (32.0 mg/kg) and NS-45 (143 mg/kg), beryllium at NS-45 (estimated 17 mg/kg), chromium at locations NS-37 (106 mg/kg), NS-44 (116 mg/kg), and NS-45 (24.8 mg/kg), copper at all locations except NS-40 and NS-46, cadmium at NS-38, NS-39, NS-44, and NS-45 (at concentrations ranging from 5.7 to 24.8 mg/kg), antimony at NS-45 (estimated 413 mg/kg), vanadium at locations NS-37 (14.3 mg/kg), NS-44 (12.4 mg/kg), and NS-45 (12.7 mg/kg), zinc at all locations except NS-46, arsenic at locations NS-39, NS-40, NS-41, NS-44 and NS-45 (concentrations range from 4.4 to 28.4 mg/kg), lead at NS-39, 43, 44, and 45 at concentrations ranging from 23.4 to 3,230 mg/kg, mercury at NS-45 (0.20 mg/kg), selenium at NS-44 (estimated 1.8 mg/kg), and tin at NS-44 and NS-45 (208 and 2,230 mg/kg, respectively).

Fluoride was detected at all locations except NS-41. Concentrations of fluoride range from 34 mg/kg to 790 mg/kg. Concentrations of fluoride which exceed the 95 % UCL on the mean background concentration for this compound were detected at NS-38, 39, 44, 45, and 46 (Table 4-1 and Figure 4-5). Cyanide was not detected in any samples collected beneath SWMUs #1 and #2.

#### 4.1.2.2 SWMU #3 Soil Sampling

SWMU #3 consists of a number of contiguous and non-contiguous former foundry waste pile areas as identified through a file search. Twenty-six soil samples were collected beneath SWMU #3 at twenty-three locations shown on Figure 4-1. In general, sample locations for SWMU #3 were selected to provide a uniform sampling coverage.

Soil samples from the 23 locations in SWMU #3 (Figure 4-1) were collected from native soil at depths ranging from six inches to nine feet below the surface. Samples at SB-1, 2, and 3, the northern most area of SWMU #3 (northwest corner of the manufacturing parcel), were collected with a split spoon at depths ranging from 4.5 to 7 feet below the surface. The soil at these locations was generally quartz sand which contained black, silty, organic accumulations. Some gravel (20%) was encountered at SB-2. A portion of SWMU #3 is located in the west-central portion of the site. Soil samples in this area were collected at SB-10, 14, 15, 16, 18, 19, 21, and 22. Native soil in this area was sampled at depths ranging from 4 to 9 feet below the surface with the split-spoon. Soil samples in this area were mostly fine to medium quartz sand with black, silty, organic material present (trace to 10 percent) at some locations. Some gravel (20%) was present in the samples from SB-10, SB-18, and SB-22. At location SB-16, a 0.5 foot thick sand and gravel seam was included in the soil sample. Soil samples from the eastern area of SWMU #3 were collected at depths from 6 to 12 inches below the surface with the hand auger (HASB-27, 28, 29, and 30). Soil at depths of 1 to 3 feet below the surface were collected with split-spoons (SB-25, 26, 31, 32, 33, 34, 35, and 36). Native soil samples collected in this area were generally fine to coarse grained quartz sand containing 10 to 50 percent gravel.

All samples excluding NS16/6.5-7' and NS14/4.5-5' were analyzed for the Appendix IX inorganics plus fluoride. Three duplicate samples for inorganics analyses were collected from locations SB-10, SB-18, and HASB-27. Five samples were collected from randomly selected locations SB-2, 14, 16, 26, and 30 and were also analyzed for VOCs and SVOCs. Random selection was accomplished using a random number table, ignoring any selections outside the set of sample location numbers (Figure 4-1) within SWMUs 3. Two duplicate samples, one each for VOCs and SVOCs analyses were collected from location SB-14. Matrix spike and matrix spike duplicate analysis were performed on two samples collected from locations SB-2 and SB-18. In addition, three equipment blanks were collected during the SWMU #3 soil sampling.

4.1.2.2.1 SWMU #3 Soil Sampling Procedures

Two methods were utilized to obtain soil samples beneath SWMU #3. At sample locations HASB-27 through HASB-30, a hand auger was used to collect the samples, using the same methodologies and decontamination procedure described in Section 4.1.1.4.1 and 4.1.1.4.2. At these locations, native soil was encountered within a few inches of the ground surface. However, at all other locations, coarse fill material inhibited soil collection with a hand auger, and a drill rig equipped with hollow stem augers and split-spoon samplers was used to facilitate sample collection.

Hollow-stem augers, split spoons, a stainless steel bowl, and stainless steel scoop were used to collect samples from locations beneath SWMU #3 where hand-augering was not feasible. Prior to collecting each sample, the equipment was decontaminated. Disposable gloves were worn and changed frequently while the equipment was cleaned to avoid contamination. The drill augers, rods, tools, rig, and any piece of drilling equipment that came in contact (directly or indirectly) with sediment or groundwater, was hot pressure washed on site prior to drilling. The split-spoon sampler, bowl and scoop were decontaminated prior to each sample collection using the same procedure outlined in Section 4.1.1.4.1. The drilling equipment was hot pressure washed on the permanent decontamination pad between each borehole, and prior to leaving the site. All on-site steam cleaning and split-spoon decontamination activities were monitored by the hydrogeologist.

4.1.2.2.2 Sample Collection

Samples obtained with the hand auger (locations HASB-27 through HASB-30) were collected using the same procedure described in Section 4.1.1.4.2. The other subsurface samples at SWMU #3 were collected using 3-1/4 inch inner diameter hollow-stem augers (ASTM 1452) and a two-foot long, split-spoon core sampler (ASTM 1586/1587). A coring machine was used to remove the overlying concrete at sample locations within the existing building. A standard 140-

pound hammer with a 30-inch drop was used to advance the split-spoon sampler. Samples were collected continuously and the number of hammer drops for each 6-inch interval was recorded in the field book. Soils were described according to the "Field Pocket Guide to Description and Sampling of Contaminated Soils" (USEPA, 1991) and descriptions were also recorded in the field book. The soil boring information was later transferred to a Soil Boring Log form. Boring logs for the near surface soil sampling are included as Appendix J.

Prior to collecting and retaining soil from the split spoon sampler, the top several inches of sediments that may have caved into the bottom of the borehole were removed from the sampler and discarded. New latex gloves were worn for each soil sample collected. Soil for VOCs analysis was collected directly from the split-spoon with the stainless steel scoop and packed tightly into the sample container. The soil was then described and descriptions were recorded in the field book. Using the scoop, the remaining soil was first transferred to the bowl and then placed into the appropriate sample containers for the remaining parameters. All soil samples were labeled as described in Section 4.1.1.4.2 and immediately placed on ice in the laboratory cooler. All samples were submitted under proper chain-of-custody and sample preservation procedures to the laboratory.

Following the collection of samples at locations SB-10, SB-25, and SB-31, equipment blanks designated FMGWMWE, FMGWMWD, and FMGWMWG were collected. The split-spoon, bowl and scoop were decontaminated as outlined in Section 4.1.1.4.1. Laboratory deionized water was then poured through the split-spoon over the shovel and collected in the bowl. The water was then poured from the bowl directly into the appropriate sample containers provided by the laboratory. Necessary preservatives were added and the samples were labeled. All three equipment blanks were analyzed for Appendix IX Inorganics plus fluoride and total cyanide. Equipment blank FMGWMWD was also analyzed for VOCs and SVOCs. The samples were shipped under proper chain-of-custody and sample preservation procedures to the laboratory.

4.1.2.2.3 SWMU #3 Soil Sampling Results

The soil analytical results for SWMU #3 are listed on Table 4-4. VOC concentrations detected in the near surface soil samples are included on Figure 4-3. The equipment blank results indicate that FMGWMWD did not contain detectable amounts of VOCs, SVOCs, Appendix IX Inorganics, fluoride or cyanide. Lead was detected in FMGWMWE and FMGWMWG at concentrations of 40.8 ug/L and 16.1 ug/L, respectively. Copper and zinc were also detected in FMGWMWE at respective concentrations of 36.0 ug/L and 85.0 ug/L. Results for the equipment blanks (reported in ug/L) are listed along with the near surface soil sampling results for SWMU #3 on Table 4-4.

All five near surface soil samples (plus the duplicate sample) analyzed for VOCs contained estimated concentrations of acetone ranging from 8.8 to 37 ug/kg. Since all acetone concentrations were below the quantitation limit and acetone was also detected in the method blanks associated with these samples, acetone is estimated as non-detect in all samples (Appendix H). Methyl ethyl ketone was detected in samples collected from SB-16 (6.5 to 7 feet) and SB-26 (1 to 3 feet) at estimated concentrations of 10 ug/kg and 3.9 ug/kg, respectively. Methylene chloride was detected in the samples from SB-14 (4.5 to 5 feet) and SB-16 at estimated concentrations of 4.0 and 6.7 ug/kg, respectively. No other VOC constituents were detected in samples collected from SWMU #3.

SVOC concentrations detected in near surface soil samples are included on Figure 4-4. The data validation summary is included in Appendix H. SVOC constituents were detected in samples collected from locations SB-14 and SB-16 at depths of 5 to 7 and 7 to 9 feet, respectively. SVOC constituents were also detected in the duplicate sample collected from SB-14 (5 to 7 feet). Anthracene (79 ug/kg), benzo(a)anthracene (190 ug/kg), benzo(b)fluoranthene (210 ug/kg), benzo(k)fluoranthene (91 ug/kg), benzo(g,h,i)perylene (74 ug/kg), benzo(a)pyrene (160 ug/kg),

chrysene (260 ug/kg), fluoranthene (350 ug/kg), indeno(1,2,3-cd)pyrene (71 ug/kg), 2-methylnapthalene (44 ug/kg), phenanthrene (310 ug/kg), and pyrene (300 ug/kg) are the compounds which were detected in the sample collected at SB-14; all at estimated concentrations. The duplicate collected from SB-14 contained estimated concentrations of anthracene, benzo(k)fluoranthene, benzo(g,h,i)perylene, benzo(a)pyrene, indeno (1,2,3-cd)pyrene, and 2-methylnapthalene. Other compounds detected at estimated concentrations in the duplicate which were not detected in the sample from SB-14 include: acenapthene (89 ug/kg), dibenzofuran (86 ug/kg), fluorene (95 ug/kg), and napthalene (84 ug/kg). SVOC constituents detected at SB-14 (duplicate) above detection limits (not estimated) include: benzo(a)anthracene (500 ug/kg), benzo(b)fluoranthene (420 ug/kg), bis(2-ethylhexyl)phthalate (710 ug/kg), chrysene (550 ug/kg), fluoranthene (950 ug/kg), phenanthrene (1,100 ug/kg), and pyrene (740 ug/kg). The soil sample from SB-16 (7 to 9 feet) contained alpha,alpha-dimethyl phenethyl at an estimated concentration of 1,900 ug/kg and pentachloroethane at an estimated concentration of 160 ug/kg.

Concentrations of Appendix IX metals detected in the near surface soil samples collected for SWMU #3 are included on Figure 4-5. The soil MS/MSD recoveries associated with the QC samples were outside the control criteria limits for several metals in select samples. The analytical results for samples associated with these samples are qualified as estimated based on data validation (Table 4-4). In addition, all selenium post digestion spike recoveries were below the control criteria and the selenium sample results are qualified as estimated. Analytes detected in associated blanks include beryllium at SB-10, and lead and zinc at SB-35. The sample results for these metals are qualified as not detected based on the blank results. The data validation summary report is included as Appendix H.

Silver was detected in the samples collected from locations SB-10, SB-14, SB-21, and SB-22 at sample depths ranging from 4 to 6 feet below the surface at concentrations ranging from 1.3 to 4 mg/kg. Barium was detected in all the samples at concentrations ranging from 4.9 mg/kg at

SB-18 (5.5 to 6 feet) to 219 mg/kg at SB-21 (5.5 to 6 feet). At locations SB-10, SB-14, and SB-34, berylium was detected at concentrations which range from 0.6 to 2.8 mg/kg at a depth of 4 to 7 feet below the surface. Cadmium was detected in samples collected from 1 to 7.5 feet below the surface at locations SB-3, SB-10, SB-14, SB-18, SB-19, SB-21, SB-22, SB-25, and SB-26 with concentrations ranging from 1.1 mg/kg to 40.5 mg/kg. Cobalt concentrations range from 5.1 to 13.6 mg/kg and were detected in samples collected from 6 inches to 7 feet below the surface at locations SB-10, SB-14, SB-21, SB-22, SB-25, SB-26, SB-31 SB-32, SB-33, SB-36, HASB-27, HASB-29 and HASB-30. All the samples collected contained chromium at concentrations which range from 3.0 mg/kg at SB-15 (6 to 7 feet) to 43.0 mg/kg at SB-36 (1 to 3 feet). Copper was also detected in all samples at concentrations ranging from 2.5 mg/kg at SB-1 (4.5 to 5 feet) to 4,320 mg/kg at SB-21 (5.5 to 6 feet). Concentrations of nickel, detected at all sample locations except SB-1, range from 4.3 mg/kg at HASB-29 (6 to 12 inches) to 414 mg/kg at SB-10 (duplicate, 4 to 6 feet). At locations SB-10, SB-14, and SB-21, at depths ranging from 4 to 7 feet, antimony was detected at concentrations of 351, 82.3, and 234 mg/kg, respectively. Vanadium was detected at all locations except SB-15 and SB-16 at concentrations that range from 5 mg/kg at SB-26 (1 to 3 feet) to 14.2 mg/kg at SB-25 (1.5 to 2 feet). Detectable concentrations of zinc, arsenic and lead were reported in all the samples beneath SWMU #3. Zinc concentrations range from 12.7 mg/kg at SB-33 (2 to 2.5 feet) to 5,530 mg/kg at SB-14 (5 to 7 feet). Concentrations of arsenic range from 1.2 mg/kg at SB-1 (4.5 to 5 feet) and SB-16 (7 to 9 feet), to 53.1 mg/kg at SB-10 (duplicate, 4 to 6 feet). Lead concentrations range from 2.2 mg/kg at SB-1 (4.5 to 5 feet) to 10,600 mg/kg at SB-10 (duplicate, 4 to 6 feet). Mercury was detected at SB-2, SB-14, SB-21, SB-22, HASB-27, and SB-10 (Duplicate) samples at depths ranging from 6 inches to 7 feet below land surface. Mercury concentrations range from 0.11 to 0.66 mg/kg. Selenium was detected at SB-3, SB-10, SB-14, and SB-21 in samples collected from 4 to 7 feet below the surface, at concentrations that range from 0.91 to 6.0 mg/kg. Tin concentrations, at locations SB-2, SB-3, SB-10, SB-14, SB-21, SB-22, and SB-25, range from 117 mg/kg to 3,040 mg/kg at sample depths of 1.5 to 7 feet. Thallium was not detected in any of the samples from the SWMU #3 areas.

Fluoride concentrations, where detected in the near surface soil samples, are included on Figure 4-5. The soil matrix spike recovery for fluoride was below the control limits and all positive fluoride results are qualified as estimated. Fluoride was not detected at locations SB-10, SB-16, SB-31, SB-34, SB-35, SB-36 and HASB-30. Where detected, estimated fluoride concentrations range from 23 mg/kg to 360 mg/kg at sample depths from 6 inches to 7.5 feet. Cyanide was sampled one day beyond the 14-day holding time for samples collected at SB-10 and SB-31. Although not detected, cyanide results for these samples were qualified as estimated based on data validation. Cyanide was detected in only one soil sample at SWMU #3, from SB-14 (5 to 7 feet), at a concentration of 0.34 mg/kg.

4.1.2.2.4 SWMU #3 Soil Results Compared to Background

For VOCs and SVOCs, SWMU #3 soil data were considered to be significantly different from background if any concentrations exceed two times the detection limit. None of the VOCs detected at SWMU #3 exceed this criteria. Several SVOC constituents which exceed background were detected at SB-14. These compounds were fluoranthene (950 ug/kg), phenanthrene (1,100 ug/kg), and pyrene (740 ug/kg).

Results for native soils beneath SWMU #3 were compared to the 95% UCL of means for the background or, in the case where constituents were BDL in the background samples, SWMU #3 data were considered to be significantly different from background if it excceeds two times the detection limit.

Barium concentrations in samples from locations SB-2, SB-3, SB-10, SB-14, SB-21, SB-22, SB-25 and SB-32 exceed the 95% UCL on the mean of the background concentration. Chromium concentrations detected at locations SB-21 (22.0 mg/kg), SB-31 (27.6 mg/kg), and SB-36 (43.0 mg/kg) exceed the 95 % UCL on the chromium mean background concentration. The

95 % UCL on the mean background concentration for copper is exceeded at all locations except SB-1 and HASB-29. The 95 % UCL on the mean background concentration for nickel were exceeded at SB-2, 3, 10, 14, 15, 16, 21, 22, 25, 31, and 36, and HASB-30. The vanadium concentration detected at SB-25 (14.2 mg/kg) is the only sample location in SWMU #3 which exceeds the 95 % UCL on the mean background concentration for this metal. At all locations except SB-1, SB-32, SB-33, SB-34, and HASB-29, zinc concentrations detected exceed the 95 % UCL calculated for zinc. Arsenic concentrations detected at locations SB-2, SB-3, SB-10, SB-14, SB-21, SB-22, SB-25, SB-31, and SB-36, which range from 3.7 to 53.1 mg/kg, exceed the 95 % UCL calculated for arsenic. The 95 % UCL calculated for lead is exceeded at all locations excluding SB-1, SB-15, SB-32, SB-33, SB-34, SB-35, HASB-29, and HASB-30. Exceedance concentrations range from 11.6 to 10,600 mg/kg. Concentrations of metals detected in the near surface soil samples which exceed the calculated 95 % UCLs for barium, cobalt, chromium, copper, nickel, vanadium, zinc, arsenic, and lead, are indicated on Table 4-1.

Concentrations of metals exceeding two times the BDL in background samples were detected at the following locations: silver at SB-10 (duplicate) at a concentration of 4 mg/kg, beryllium detected at SB-14 (2.8 mg/kg), cadmium at SB-3, SB-10, SB-14, SB-19, SB-21, SB-22, and SB-26 at concentrations ranging from 4.1 to an estimated 40.5 mg/kg, antimony at SB-10 (duplicate), SB-14, and SB-21 at concentrations from 82.3 to 351 mg/kg, mercury at SB-10 (duplicate), SB-14, SB-21 and SB-22 at concentrations ranging from 0.27 to 0.66 mg/kg, selenium at SB-3, SB-10, and SB-14 at estimated concentrations ranging from 2.3 to 6 mg/kg, and tin at SB-3, SB-10 (duplicate), SB-14, SB-21, SB-22, and SB-25 at concentrations from 311 to 3,040 mg/kg.

Locations in SWMU #3 which exceed the 95 % UCL on the mean background concentration for fluoride include SB-1, 14 (5-7 feet), 15, 18, 19, 22, 25, and HASB-28 and 29.

### 4.1.2.3 SWMUs #4, #5, #6, and #7 Soil Sampling

A total of 7 soil samples were collected from beneath SWMUs #4, #5, #6, and #7. These samples were analyzed for the Appendix IX inorganics plus fluoride. SWMU #4 consisted of used baghouse bags (in addition to wood and paper trash). SWMU # 5 contained drummed zinc sludge, and SWMU #6 contained piles of zinc sludge. SWMU #7 possibly stored used, cleaned-out acid drums. Sampling and SWMU locations are shown on Figure 4-1.

#### 4.1.2.3.1 SWMUs #4, #5, #6, and #7 Soil Sampling Procedures

Samples beneath SWMUs #4, #5, #6 and #7 were collected with split-spoon samplers using the same collection and decontamination methods described in Section 4.1.1.4.1. The samples were collected at depths ranging from 1 to 6 feet below the surface. A duplicate sample was collected at location SB-20. Following the sample collection at location SB-23, equipment blank FMGWMWF was collected and analyzed for Appendix IX Inorganics plus fluoride. The equipment blank was collected using the same procedures described in Section 4.1.1.4.1.

Native soil was sampled beneath SWMU #4 at location SB-20 from 3 to 5 feet below the surface. Soil at this location was fine to medium-grained quartz sand with 10% gravel. At SWMU #5 native soil at SB-23 and SB-24 from 1 to 3 feet, consisted of fine to medium quartz sand, and contained 10 to 20 % gravel. Soil samples collected from 4.5 to 6 feet at SB-11, SB-12 and SB-13 beneath SWMU #6, were fine sand with no gravel present. At locations SB-12 and SB-13, black, silty, organic accumulations occur in the sand. Soil sampled beneath SWMU #7, at location SB-17 from 3 to 5 feet, was fine to medium quartz sand containing 20 % gravel. Detailed soil descriptions are included on the boring logs in Appendix J.

4.1.2.3.2 SWMUs #4, #5, #6, and #7 Soil Sampling Results

The analytical results for Appendix IX inorganics plus fluoride constituents for SWMUs #4, #5, #6, and #7 are listed on Table 4-5. The laboratory analytical results and chain-of-custody documentation as well as the data validation summary reports are included in Appendix H.

For the metals, the soil MS/MSD recoveries associated with the QC samples were outside the control criteria limits for several metals in select samples. The analytical results for samples associated with these samples are qualified as estimated based on data validation (Table 4-5). In addition, all selenium post digestion spike recoveries were below the control criteria and the selenium sample results are qualified as estimated. Analytes detected in associated blanks include lead, nickel, and zinc at SB-17, beryllium at SB-20, and lead, copper, and zinc at SB-24. The sample results for these metals are qualified as not detected based on the blank results. The data validation summary report is included as Appendix H.

Fluoride concentrations, where detected in the near surface soil samples, are included on Figure 4-5. The soil matrix spike recovery for fluoride was below the control limits and all fluoride results are qualified as estimated. Cyanide was sampled one day beyond the 14-day holding time for samples collected at SB-17, 20, 23, and 24. Although not detected, cyanide results for these samples were qualified as estimated based on data validation. Cyanide was not detected in soils at SWMUs 4, 5, 6, and 7.

Copper, lead, and mercury were detected in the equipment blank (FMGWMWF) at concentrations of 17.0 ug/L, 18.2 ug/L, and 0.64 ug/L, respectively.

In the sample collected from 3 to 5 feet at SB-20 (SWMU #4), barium (56.1 mg/kg), cadmium (2.6 mg/kg), chromium (113.0 mg/kg), copper (505 mg/kg), nickel (35.2 mg/kg),

antimony (36.2 mg/kg), vanadium (32.7 mg/kg), zinc (987 mg/kg), arsenic (7.5 mg/kg), lead (881 mg/kg), and tin (152 mg/kg) were detected. Fluoride and cyanide were not detected in the sample from SWMU #4.

Soil samples for SWMU #5 were collected at SB-23 and SB-24. All metals were detected at SB-23 (1 to 3 feet). At SB-24 only barium, chromium, and arsenic were detected. Maximum concentrations detected at SWMU #5 include: silver (7.7 mg/kg), barium (402 mg/kg), beryllium (6.9 mg/kg), cadmium (118 mg/kg), cobalt (13.0 mg/kg), chromium (45.9 mg/kg), copper (8,830 mg/kg), nickel (474 mg/kg), antimony (6,560 mg/kg), vanadium (13.9 mg/kg), zinc (17,100 mg/kg), arsenic (189 mg/kg), lead (30,300 mg/kg), mercury (2.9 mg/kg), selenium (6.1 mg/kg), thallium (1.1 mg/kg) and tin (4,670 mg/kg). Fluoride and cyanide were not detected in either sample from SWMU #5.

Results from samples collected from 4.5 to 6 feet at locations SB-11, SB-12, and SB-13 (SWMU #6) indicate that all metals were detected except for beryllium and thallium. Maximum concentrations detected at SWMU #6 include: silver (5.9 mg/kg), barium (2,100 mg/kg), cadmium (20 mg/kg), cobalt (11.6 mg/kg), chromium (24.1 mg/kg), copper (15,400 mg/kg), nickel (182 mg/kg), antimony (73.6 mg/kg), vanadium (20.7 mg/kg), zinc (26,700 mg/kg), arsenic (25.1 mg/kg), lead (36,000 mg/kg), mercury (1.5 mg/kg), selenium (2.5 mg/kg), and tin (2,920 mg/kg). The greatest concentrations for metals were detected in the sample collected from 4.5 to 5 feet at SB-12. Fluoride was also detected in two samples collected beneath SWMU #6 at concentrations of 46 mg/kg and 130 mg/kg from locations SB-11 and SB-12, respectively.

At SB-17 (SWMU #7) the sample was collected from 3 to 5 feet. Metals detected at this location include barium (4.6 mg/kg), cobalt (5.1 mg/kg), chromium (5.2 mg/kg), vanadium (5.4 mg/kg), and arsenic (3.4 mg/kg).

4.1.2.3.3 SWMUs #4, #5, #6, and #7 Soil Results Compared to Background

Results for native soils beneath SWMUs #4, #5, #6, and #7 were compared to the 95% UCL of means for the background or, in the case where constituents were BDL in the background samples, the data were considered to be significantly different from background if it exceeds two times the detection limit.

Total metals and fluoride results for native soils beneath SWMUs #4, #5, #6, and #7 were compared to the 95% UCL of means for the background site. At SWMU #4, barium, chromium, copper, nickel, vanadium, zinc, arsenic, and lead concentrations exceeded the 95% UCLs on the means of the background concentrations calculated for those metals (Table 4-1). Barium, chromium, copper, nickel, vanadium, zinc, arsenic, and lead concentrations detected at SWMU #5 exceed the 95% UCLs on the means for background. At SWMU #6, barium, chromium, copper, nickel, vanadium, zinc, arsenic, and lead concentrations detected at SB-12 exceed the 95% UCLs on the means of the background concentrations. Fluoride was also detected in two samples collected beneath SWMU #6 which exceed the 95% UCLs on the means of the background. At SWMU #7, copper exceeds the 95% UCLs on the means.

Concentrations of metals exceeding two times the BDL in background samples and the respective locations are as follows: silver at SB-12 (SWMU #6) and SB-23 (SWMU #5), beryllium detected at SB-23, cadmium at all soil sample locations except SB-17 (SWMU #7) and SB-24 (SWMU #5), antimony, mercury, selenium, and tin at SB-12 and SB-23.

**4.1.2.4 SWMU #8**

SWMU #8 is the old main baghouse, small adjacent baghouse, and baghouse dust drums area. An inspection of the concrete floor of the main baghouse was performed during waste

sampling (Section 3.7). More than one-half of the floor was covered with a dust which prevented a complete visual inspection. The inspection of that portion of the concrete floor which was visible during the waste sampling suggests that the integrity of the floor is in good condition. A further inspection of the floor will be performed once the dusts have been removed. To date, no soil sampling has been conducted beneath SWMU #8.

In order to develop closure strategies and cost estimates for SWMU #8, an inventory of the baghouse contents was performed in February 1996. The inventory included a listing of stored materials, a site layout map, and photographic documentation of the site. During the inventory, several potential asbestos containing materials (ACMs) were identified. Based on the inventory results, an asbestos survey was subsequently conducted by an IDEM certified inspector. Costs for removal of existing inventory, decontamination and disposal, and demolition of the baghouse have been solicited for incorporation into the CMS.

#### 4.1.2.5 SWMU #9 Soil Sampling

Four soil samples were collected at locations SB-7, SB-8 and SB-9 from beneath and adjacent to SWMU #9, the location of a former underground storage tank (UST). The UST had stored waste oil and was removed in May 1992. The location of SWMU #9 and the sampling locations are shown on Figure 4-1.

Two soil samples were collected at SB-8 from depths of 5 to 7 and 7 to 8 feet, directly beneath the center of the former tank. Two samples were collected at this location because there was not enough soil volume recovered in the split spoon from 5 to 7 feet for analysis of all required parameters. MS/MSD analyses were performed for both samples collected at SB-8. A sample was also taken on each side of the former tank location at SB-7 (5 to 7 feet) and SB-9 (4 to 6 feet). A duplicate soil sample was collected from SB-9. The samples from SB-7 and SB-9 were analyzed for VOCs, SVOCs and Appendix IX Inorganics plus fluoride. The sample from 5 to 7 feet at SB-8

was analyzed for VOCs and Appendix IX Inorganics plus fluoride, while the sample from 7 to 8 feet was analyzed for SVOCs. After the sample was collected at SB-7, equipment blank FMGWMWH was collected and analyzed for VOCs, SVOCs, and Appendix IX Inorganics plus fluoride.

Soil sampled at SWMU #9 was generally fine to medium grained quartz sand which contained 10 to 20 % gravel. Crushed limestone backfill material was present to a depth of 4 feet below the surface at SB-8. Soil boring logs with detailed lithologic descriptions are attached in Appendix J.

4.1.2.5.1 Soil Sampling Procedure at SWMU #9

Samples beneath and adjacent to SWMU #9 were collected with split-spoon samplers using the same collection and decontamination methods described in Section 4.1.1.4.1. A coring machine was used to remove the overlying concrete at locations SB-7 and SB-9. A portion of the soil from each split-spoon sample was screened with a photo-ionization detector (PID). The PID was calibrated according to manufacture's instructions prior to use. PID screening was performed by placing a portion of the split-spoon sample in a clean mason jar, covering with foil for several minutes, and carefully puncturing the foil with the tip of the PID probe to take a headspace reading. The equipment blank was collected using the same procedure described in Section 4.1.1.4.1.

4.1.2.5.2 SWMU #9 Soil Sampling Results

Soil sampling results for SWMU #9 are listed on Table 4-6. Concentrations of VOCs detected in the near surface soil samples are shown on Figure 4-3. Both zinc and lead were detected in the equipment blank (FMGWMWH) at concentrations of 199 ug/L zinc and 8 ug/L lead. No VOCs or SVOCs were detected in the equipment blank sample.

VOCs detected in the samples include; acetone, methyl ethyl ketone, tetrachloroethene, and trichloroethene. Based on data validation, methyl ethyl ketone was also detected in the method blank. Positive results for this compound at SB-8 and SB-9 (duplicate) were qualified as non-detect. Acetone was detected only in the sample from SB-7 (5 to 7 feet) at an estimated concentration of 21 ug/kg. All of the samples contained detectable concentrations of tetrachloroethene ranging from 110 ug/kg at SB-7 to 13,000 ug/kg at SB-8 (5 to 7 feet). Trichloroethene was also detected in soil at each location. Concentrations detected range from 370 ug/kg at SB-7 to 1,900 ug/kg at SB-8.

Concentrations of SVOCs detected in the near surface soil samples for SWMU #9 are shown on Figure 4-4. All concentrations were detected at less than the reporting limit and are estimated. SVOCs were detected in samples from locations SB-8 and SB-9. Estimated concentrations of acenaphthene (47 ug/kg), phenanthrene (120 ug/kg), and pyrene (60 ug/kg) were detected in the samples collected from 4 to 6 feet at SB-9. At location SB-8 (7 to 8 feet), estimated concentrations of benzo(a)anthracene (47 ug/kg), chrysene (81 ug/kg) and pyrene (95 ug/kg) were detected.

Concentrations of metals detected in the near surface soil samples for SWMU #9 are shown on Figure 4-5. Based on data validation, cadmium at SB-9 was also detected in the blank for this sample and is qualified as not detected. In addition, barium, copper, nickel, and zinc concentrations are estimated based on data validation results (Appendix H). Concentrations of barium, chromium, copper, nickel, vanadium, zinc, arsenic and lead were detected at each location. Maximum concentrations of these metals include; 24.0 mg/kg barium, 7.5 mg/kg chromium, 803 mg/kg copper, 23.3 mg/kg nickel, 8.4 mg/kg vanadium, 1,010 mg/kg zinc, 3.9 mg/kg arsenic, and 388 mg/kg lead. At location SB-9, concentrations of beryllium (0.6 mg/kg), cadmium (1.5 mg/kg), and tin (107 mg/kg) were also detected.

Fluoride was not detected in any of the samples collected from beneath SWMU #9. The soil matrix spike recovery for fluoride was below the control limits and all fluoride results are qualified as estimated and not detected. Cyanide was sampled one day beyond the 14-day holding time for the sample collected at SB-8 (5-7'). Although not detected in the sample, cyanide was qualified as estimated and not detected for this sample. Cyanide was not detected in soils at SWMU #9.

4.1.2.5.3 SWMU #9 Soil Results Compared to Background

VOCs detected at SWMU #9 at concentrations greater than two times the detection limit were tetrachloroethene, and trichloroethene. None of the estimated but detected concentrations of SVOCs at SWMU #9 were greater than two times the detection limit.

Barium, copper, nickel, zinc, arsenic, and lead concentrations detected in soil at SWMU #9 exceed the 95% UCL on the means of the background concentrations for those metals (Table 4-1). None of the metals which were BDL in the background soil exceed two times the detection limit at SWMU #9.

**4.1.2.6 Soil Sampling Adjacent to SWMU #10**

A total of six soil samples were collected at locations SB-4, SB-5, and SB-6 adjacent to and north (hydraulically downgradient) of SWMU #10. SWMU #10 is an existing building which contained the former chlorothene solvent rags evaporation area. The sampling locations and the location of SWMU #10 are shown on Figure 4-1. Two samples from each location were collected and analyzed for Appendix IX metals plus fluoride and cyanide, VOCs, and SVOCs. An equipment blank was not collected during sampling at SWMU #10.

The shallower samples at each location were collected at depths ranging from 1 to 5 feet below the surface. The deeper samples were collected from 5 to 7 feet below the surface. Soil sampled beneath SWMU #10 was generally fine to coarse quartz sand containing 10 % silt and 10% gravel. Black, silty organic material and roots were present at locations SB-4 and SB-5. Detailed lithologic descriptions are included in the boring logs in Appendix J.

4.1.2.6.1 SWMU #10 Soil Sampling Procedure

Samples adjacent to SWMU #10 were collected with split-spoon samplers using the same collection and decontamination methods described in Section 4.2.2.2. The sample with the highest PID response and a deeper sample with a lesser response in each boring were selected for laboratory analysis.

4.1.2.6.2 SWMU #10 Soil Sampling Results

Analytical results for soil collected adjacent to SWMU #10 are listed on Table 4-7. Concentrations of VOCs detected in the near surface soil samples at SWMU #10 are included on Figure 4-3. Acetone was detected in all the samples at estimated concentrations ranging from 5.5 to 36 ug/kg. In the shallow sample (3 to 5 feet) at SB-4, 1,2-dichloroethene (120 ug/kg), tetrachloroethene (560 ug/kg), and trichloroethene (570 ug/kg) were detected. VOCs detected in the deep sample at SB-4 (5 to 7 feet) include, 1,1-dichloroethane (30 ug/kg), 1,2-dichloroethene (33 ug/kg), and trichloroethene (1,500 ug/kg). Only methyl ethyl ketone was detected at an estimated concentration of 6.9 ug/kg in the shallow sample collected from 1 to 3 feet at SB-5. Both shallow and deep samples collected at SB-6 contained methylene chloride (4.4 and 2.8 ug/kg) and tetrachloroethene (6.7 and 6.4 ug/kg), respectively.

Concentrations of SVOCs detected in the near surface soil samples are included on Figure 4-4. In the shallow sample collected at SB-4, concentrations of acenapthene (9,300 ug/kg), analine

are transported to the receiving facility utilizing IEPA's supplemental permit system and manifest system.

**Conclusion:**
No RCRA violations were detected during the inspection. However, I recommended that the facility's waste minimization plans be updated.

(24,000 ug/kg), benzo(a)anthracene (5,700 ug/kg), aramite (990 ug/kg), benzo(g,h,i)perylene (1,100 ug/kg), benzo(a)pyrene (3,100 ug/kg), chrysene (6,600 ug/kg), dibenzofuran (14,000 ug/kg), fluoranthene (4,800 ug/kg), fluorene (18,000 ug/kg), napthalene (1,300 ug/kg), phenanthrene (74,000 ug/kg), and pyrene (29,000 ug/kg) were detected. The deeper sample collected at SB-4 contained anthracene (110 ug/kg), fluorene (74 ug/kg), dibenzofuran (57 ug/kg), di-n-butyl phthalate (150 ug/kg), phenanthrene (330 ug/kg), and pyrene (200 ug/kg). Di-n-butyl phthalate was detected in both shallow and deep samples from SB-5 at concentrations of 440 and 460 ug/kg. No other SVOC constituents were detected in either sample from SB-5. The shallow soil sample collected at SB-6 contained an estimated concentration of 42 ug/kg benzo(b)fluoroanthene. No SVOCs were detected in the deep sample at SB-6.

Concentrations of metals detected in the near surface soil samples collected adjacent to SWMU #10 are included on Figure 4-5. Barium, cadmium, chromium, copper, nickel, vanadium, zinc, arsenic and lead were detected in both shallow and deep soil samples at each location. Maximum concentrations detected include: 113 mg/kg barium, 34.5 mg/kg cadmium, 12.7 mg/kg chromium, 5,150 mg/kg copper, 65.3 mg/kg nickel, 12.2 mg/kg vanadium, 6,510 mg/kg zinc, 11.4 mg/kg arsenic, and 2,020 mg/kg lead. Highest concentrations for these metals were all detected in the samples from SB-6. In addition to the above metals, antimony (33.4 mg/kg), mercury (1.2 mg/kg), and tin (285 and 572 mg/kg) were also detected at SB-6. Cobalt, mercury, and tin were also detected at locations SB-4 and SB-5 at concentrations of 9.6 mg/kg and 5.4 mg/kg for cobalt, 0.13 mg/kg and 0.36 mg/kg for mercury, and 122 mg/kg and 224 mg/kg tin, respectively.

Fluoride was detected in samples collected at SB-4 and SB-5 at concentrations of 47 and 65 mg/kg, respectively. Cyanide was not detected in any samples collected from SWMU #10.

4.1.2.6.3 SWMU #10 Soil Results Compared to Background

VOCs detected at SWMU #10 at concentrations greater than two times the detection limit are 1,2-dichloroethene (total), tetrachloroethene, trichloroethene, and 1,1-dichloroethane.

SVOCs detected in the near surface soil samples at SWMU #10 at concentrations greater than two times the detection limit are acenapthene, analine, benzo(a)anthracene, benzo(g,h,i)perylene, benzo(a)pyrene, chrysene, dibenzofuran, fluoranthene, fluorene, napthalene, phenanthrene, and pyrene.

Barium, copper, nickel, zinc, arsenic, and lead concentrations as well as fluoride at SWMU #10 exceed the 95 % UCL of the means for the background samples. The 95 % UCL of the mean for vanadium is exceeded only at SB-6 (Table 4-1).

Concentrations of metals in soil at SWMU #10 which exceed two times the BDL in background samples are cadmium, mercury, and tin.

4.1.3 Summary of Soil Sampling for Release Characterization

In order to evaluate potential migration and transformation of constituents detected in soil, contaminant solubility, speciation, adsorption, leachability, exchange capacity, biodegradation, hydrolysis, photolysis, and oxidation rates for specific constituents are considered. A summary of these factors and their affect on migration and transformation for specific VOCs, SVOCs, and inorganics detected in soil at the site are included as Table 4-8. The results of soil sampling for release characterization are summarized below.

### 4.1.3.1 VOCs Summary for Soil

VOCs were not detected in any of the background soil samples. However, two categories of VOCs were detected in on-site soil; non-halogenated and chlorinated VOCs. Non-halogenated VOCs detected in soil were acetone, methyl ethyl ketone, carbon disulfide, toluene, and xylenes (total). Where detected, concentrations of these VOCs were low (Figure 4-3). These compounds are all water soluble and relatively mobile in water media (Table 4-8). However, biological degradation rates for these constituents are fast to very fast. Therefore, these compounds are often attenuated in the subsurface environment through unenhanced biodegradation. Of these constituents, only acetone was detected in on-site groundwater at one monitoring well location and in one surface water sample collected adjacent to the site (Sections 4.2 and 4.3). Based on the data, non-halogenated VOCs appear to be randomly distributed in soil, at low concentrations, and have limited extent in the subsurface.

In addition, four chlorinated VOCs; PCE, TCE, 1,1- DCA, and 1,2-DCE (total) were detected in soil at the site. All four chlorinated VOCs were detected in soil samples collected at SWMU #10 (Figure 4-3). SWMU #10 is the existing building which contained the former chlorothene solvent rags evaporation area. VOCs in soil beneath this SWMU were detected at depths ranging from 1 to 7 feet below grade. In addition, TCE and PCE were detected in soil at depths of 4 to 8 feet below grade beneath SWMU #9. SWMU #9 is located approximately 100 feet east of SWMU #10 and is the location of the former waste oil UST (Figure 4-1). The detections at SWMU #10 appear to be associated with the former solvent evaporation activity at this location. The source of TCE and PCE detected at SWMU #9 is not known. However, all soil samples collected at SWMU #9 were water saturated.

The four chlorinated VOCs detected in soil are water soluble. However, these constituents have moderate to high adsorption coefficients as well as the capacity to moderately exchange on

silicate minerals. These properties tend to retard migration rates of these compounds in groundwater. Of the four VOCs detected at both SWMUs, the only constituents found in groundwater at MW-12S, 90 feet downgradient of the SWMU, were TCE and 1,2-DCE. No chlorinated VOCs were detected in groundwater at MW-15S, located approximately 250 feet downgradient of these SWMUs (Section 4.2). The extent of VOCs detected in soil at these two areas appear to be limited. In addition to SWMU #9 and #10, TCE and PCE were detected at one soil sample (NS-45) collected at SWMU #1 at a depth of 9 to 9.5 feet below grade. This sampling location is located in the south central portion of SWMU #1, adjacent to the wetland area. The extent of chlorinated VOCs at this location appears to be limited to a relatively small, isolated area. This is based on the low concentrations detected as well as the soil gas investigation results (Section 3.6.1.1), and downgradient groundwater analytical results (Section 4.2.4.1).

#### 4.1.3.2 SVOCs Summary for Soil

SVOCs detected in soil include coal tar constituents, phthalates, diphenylamine, pentachloroethane, and 4,6 dinitro-2-methylphenol. Factors affecting contaminant migration and transformation of these constituents are included on Table 4-8. The solubilities of these constituents are low, especially for the coal tar constituents and phthalates. In addition, the leachability of these SVOCs are moderate to low and the capacities to exchange on silicate minerals is moderate to high. Of the SVOCs detected in on-site soil, the only constituents also detected in groundwater are fluoranthene, pyrene, and bis(2-ethylhexyl)phthalate. Concentrations of fluoranthene and pyrene were detected at very low concentrations at only one monitoring well, MW-8S. This well is located hydraulically downgradient of SWMUs #1 and #2. Bis(2-ethylhexyl)phthalate was detected in the majority of monitoring wells at the site, all at low concentrations. This constituent is a common plasticizer and lab artifact and its occurrence in the groundwater may not be related to detections in soil. In general, it appears that SVOCs are attenuated in the source areas and have not migrated in groundwater.

#### 4.1.3.3 Inorganics Summary for Soil

The native soil samples collected at the site often exceed the 95% UCL on the means calculated for background soil samples for many metals and fluoride. In addition, for inorganics not detected in background samples, native soils at the site often exceed two times the BDL for silver, beryllium, cadmium, antimony, mercury, selenium, and tin. The only inorganics not detected at the site above background were thallium, and total cyanide.

The data suggest that detected metals and fluoride have been released to the soil. Due to the shallow water table beneath the site, the majority of soil samples were also water saturated. Factors affecting contaminant migration and transformation of these inorganic constituents are included on Table 4-8. In general, the solubilities, adsorption coefficients, and exchange capacities for the inorganics tend to attenuate these constituents in the subsurface. However, for chromium, nickel, vanadium, arsenic, and fluoride, solubilities are varied to high. Arsenic and fluoride were the only inorganic constituents detected in groundwater above MCLs in the Outlot A monitoring wells. These wells are located adjacent to the northern most property line of the site and are hydraulically downgradient of the on-site SWMUs. These results agree with the expected migration and transformation data included on Table 4-8. Arsenic has a very low capacity to exchange on minerals and a low to high leachability. Fluoride has a very low adsorption coefficient, high leachability, and very low capacity to exchange on minerals. At the site, both fluoride and arsenic have migrated with groundwater.

## 4.2 GROUNDWATER

As part of the RFI Workplan (Geraghty & Miller, 1993), sixteen monitoring wells (8 nested locations), consisting of eight shallow wells (designated MW-6S through MW-13S) and eight deep wells (designated MW-6D through MW-13S), as well as two piezometers (1 nested location)

consisting of a shallow and deep piezometer (designated P-1S and P-1D), were installed at the site (Figure 2-1). In November 1995, two additional monitoring wells (MW-14S/MW-14D), consisting of a nested location of one shallow and one deep well, were installed to further evaluate constituents detected in groundwater upgradient of this well nest (Figure 2-1). The second phase of characterizing groundwater at the site, as detailed in the RFI Addendum Workplan (Geraghty & Miller, 1996), included installing five additional monitoring wells in Outlot A, downgradient of the manufacturing parcel. Three shallow wells (MW-15S, 16S, and 17S) and two deep wells (MW-16D and MW-17D) were installed at the locations shown on Figure 2-1.

All shallow monitoring wells are constructed such that the well screens intersect the water table. The bottoms of all deep well screens are positioned at the base of the Calumet Aquifer. All well screens for the nested shallow and deep wells are positioned such that each well nest monitors the total thickness of the Calumet Aquifer underlying the site. Monitoring well and piezometer construction details are included in Appendix A.

The locations of these 23 monitoring wells and two piezometers were approved by USEPA and were installed as part of the RFI implemented scope of work. Groundwater samples were collected from the monitoring wells to provide analytical data to determine whether SWMUs at the facility have released hazardous waste (Appendix IX) constituents into the Calumet Aquifer beneath the site. None of the pre-existing monitoring wells, installed during earlier investigation work at the site, were sampled for the RFI.

An off-site groundwater investigation was performed by Geraghty & Miller in September 1996, in partial fulfillment of goals outlined in the "Revised Groundwater Quality Assessment Plan" (GAP), prepared by Geraghty & Miller, and submitted to IDEM in March 1996. Groundwater sampling at off-site locations was performed employing temporary sampling points (TSPs) in both shallow and deep portions of the Calumet Aquifer north of the facility to assess the

lateral and vertical extent of dissolved arsenic and zinc and fluoride in groundwater. The results of this investigation have further defined the extent of constituents detected in on-site groundwater and at USEPA's request, are included for discussion in this report.

### 4.2.1 Monitoring Well Locations

Geraghty & Miller installed the sixteen monitoring wells (MW-6S/MW-6D through MW-13S/MW-13D) and two piezometers (P-1S/P-1D) at the facility in May and June 1995. In November 1995, two additional monitoring wells (MW-14S/MW-14D), consisting of a nested location of one shallow and one deep well were installed by Geraghty & Miller. This additional nested monitoring well location was not part of the RFI Workplan. This location was selected to evaluate concentrations of dissolved metals detected during the IDEM required sampling at MW-9S/MW-9D. MW-14S/MW-14D is located downgradient of wells MW-9S/MW-9D. Locations of all monitoring wells and piezometers are shown on Figure 2-1. The eighteen monitoring wells include the background (upgradient) monitoring wells MW-6S and MW-6D, monitoring wells immediately downgradient of SWMUs #1 and #2 (MW-7S/MW-7D, MW-8S/MW-8D, and MW-9S/MW-9D), as well as additional monitoring wells located near the downgradient edge of the facility (MW-10S/MW-10D, MW-11S/MW-11D, MW-12S/MW-12D, MW-13S/MW-13D, and MW-14S/MW-14D). MW-10S/MW-10D is located downgradient of a portion of SWMUs #3 and #6, MW-11S/MW-11D is downgradient of a portion of SWMU #3 as well as SWMUs #6 and #8, MW-12S/MW-12D is downgradient of SWMU #10 and the former waste oil storage tank (SWMU #9), MW-13S/MW-13D is downgradient of SWMU #2 and a portion of SWMU #3, and MW-14S/MW-14D is located downgradient of MW-9S/MW-9D. Piezometers P-1S and P-1D were installed off-site, north of the facility, and south of Outlot A.

In May 1996, the second phase of groundwater characterization was initiated with the installation of five monitoring wells in Outlot A. The locations of MW-15S, MW-16S/MW-16D, and MW-17S/MW-17D are shown on Figure 2-1. These wells locations were selected based on

groundwater analytical results and elevation data collected during the first phase of the investigation. Shallow well MW-15S was installed in the eastern area of Outlot A, downgradient of MW-12S, to evaluate the extent of VOCs detected in MW-12S. Shallow and deep wells were installed at the other two downgradient locations as nests (MW-16S/MW-16D and MW-17S/MW-17D) to evaluate the extent of metals (in particular dissolved arsenic) detected in nested monitoring wells MW-11S/MW-11D and MW-10S/MW-10D, respectively.

### 4.2.2 Monitoring Well Installation

Monitoring wells MW-6S/MW-6D through MW-13S/MW-13D and piezometers P-1S/P-1D were installed by Top Flight Drilling, Inc. (Top Flight) of Granger, Indiana, using 4 1/4-inch inner diameter (ID) hollow-stem auger and standard auger-drilling techniques. These sixteen monitoring wells and two piezometers were installed from May 30, through June 14, 1995. Details of MW-14S/MW-14D, installed by Top Flight in November, 1995 are discussed later in this Section. From May 13, through May 15, 1996, Top Flight also installed the five additional monitoring wells in Outlot A using the same installation methods. Continuous soil samples were collected from each of the deep monitoring wells, the deep piezometer, and MW-15S. Soil sample descriptions are detailed in Section 2.3.2. Soil boring logs are included in Appendix D.

The well casing and screen for each monitoring well are constructed of 2-inch ID, Schedule 40, flush-threaded PVC (1-inch ID for the piezometers). Prior to installation, all PVC well material was pressure washed with the steam cleaner. All shallow monitoring well screens are 10 feet in length. Well screens for the deep wells are 15 feet in length. Piezometers P-1S and P-1D are constructed with 1-foot length screens. All well/piezometer screens are 0.010-inch slot. The upper portion of the screen for the shallow well in each nest is positioned to intersect the mean water table elevation (as estimated from historical measurements) while the lower screen is positioned with its bottom at the contact between the aquifer and the underlying clay till. The annular space around the screen for the wells and piezometers is packed with a #7 quartz sand. The sand pack extends 1

to 2 feet above the top of the well screens, and 1 foot above the top of the piezometer screens. A two foot seal of bentonite is placed above the sand pack in all deep monitoring wells, shallow monitoring well MW-6S, and both piezometers. The remainder of the annular space in these wells/piezometers, to about 3 feet below the ground surface, was filled with a cement-bentonite grout (±5% bentonite) using a tremie pipe. Steel protective casing and locking cap set in a poured concrete pad were set at each well head.

All shallow monitoring wells, with the exception of MW-6S, encountered groundwater at a depth less than 3 feet below grade. In order to construct these wells with screens that intersect the water table, a special provision to the RFI, as agreed upon by USEPA, was made. These wells are completed with seals above grade using reinforced pre-cast concrete forms. The precast forms extend above grade approximately 3 feet. An 8-inch diameter outer steel casing was placed around the well riser and concreted in place. Details of these completions are included on the Well Construction Logs in Appendix A.

Two additional monitoring wells, MW-14S/MW-14D, consisting of a nested location of one shallow and one deep well were installed by Top Flight on November 16 and 17, 1995. This cluster location is located adjacent to the north property line of the site and downgradient of MW-9S and MW-9D (Figure 2-2 through Figure 2-5). This nested well location was installed to further evaluate the extent of elevated dissolved arsenic concentrations detected during IDEM required groundwater sampling at MW-9S and MW-9D. Monitoring well construction details are included in Appendix A. The soil boring log for MW-14D is included in Appendix D. MW-14S/MW-14D were to be constructed in accordance with the RFI Work Plan and as described above. However, several restrictions were present at the site with regards to the placement of this well cluster. The location restrictions noted for MW-14S/MW-14D include the following:

Underground utilities (water, sanitary and or storm sewer, telephone, and electric);

Overhead power lines along the fence line of the northern property line;

An operating dumpster for the active facility located within the alcove at the northeast corner of the building;

The access road along the north side of the facility building is not wide enough to allow for above-grade completions of monitoring wells between the facility building and the property line(would restrict truck traffic); and,

Installation of the wells off-site north of the facility and south (upgradient) of the sanitary sewer required off-site access from the City of Hammond. During this time, the city was constructing a bike path at this location. The delay caused by the permitting process as well as the potential for vandalism of any off-site wells in this area were of concern.

Based on these restrictions, MW-14S/MW-14D were installed using flush-mount completions. Flush-mount wells will not restrict vehicle traffic in this area of the site. In order to install a proper seal utilizing the flush-mount construction, the well screen for MW-14S does not intersect the water table as in the other shallow wells installed by Geraghty & Miller for the RFI at the site. A 7.5-foot well screen was used at MW-14S compared with 10-foot well screens in the other shallow wells at the site. As measured from the water table, the base of the well screen in MW-14S is situated at approximately the same elevation as well screens in previously installed shallow monitoring wells at the facility. This well screen placement at MW-14S was designed to maintain consistency between all shallow monitoring wells at the site. The deep well (MW-14D), except for the flush-mount completion, was constructed the same as previously installed deep wells at the site. However, during development of MW-14D on December 7, 1995, total depth of the

well was gauged at 20 feet. A sample of the 6 feet of fill material in the well indicated that silt and grout had entered the well. On December 28 and 29, 1995, Top Flight remobilized to the site to replace and plug and abandon MW-14D. The replacement well is located 5 feet south-southwest of the original location. A pre-packed well screen was installed at this location due to problems with heaving sand encountered during the replacement well installation. Monitoring well construction details for replacement well MW-14D are included in Appendix A. The soil boring log is included in Appendix D. The original well was plugged in-situ, according to Indiana Department of Natural Resources (IDNR) regulations, using bentonite chips and sealed at the surface with cement.

On October 18, 1995, all existing shallow monitoring wells were inspected. The results of the inspection showed that the overall integrity of the above-grade concrete structures was good. Any visible cracks were repaired during the inspection by Top Flight. Cracks were sealed with a latex, water-based caulking agent.

#### 4.2.2.1 Monitoring Well/Piezometer Development

Well development was performed in order to facilitate proper functioning of the monitoring wells/piezometers. Monitoring well/piezometer development details, dates, and turbidity levels (where applicable) are included on the Well Construction Logs in Appendix A. The monitoring wells were developed by surging with a surge block followed by pumping using a submersible pump. Well development for MW-6S/MW-6D through MW-13S/MW-13D was performed by the drilling contractor and Geraghty & Miller on June 14 through June 19, 1995. Well development at MW-14S was performed on December 7, 1995 and MW-14D was developed on January 26, 1996. The wells in Outlot A were developed on May 15, 1996. Prior to development, the submersible pump, tubing, and surge block were decontaminated according to the protocols described in Section 4.2.2.3. Development water was removed until the level of turbidity was minimized and stabilized. Turbidity was measured at each wellhead using an HF Scientific Model DRT-15 portable turbidity meter. The meter was calibrated prior to development at each well using a 0.02 natural turbidity

unit (NTU) reference standard. The goal of development for each monitoring well was a turbidity value of 5 or less. Turbidity values are included on the Well Construction Logs in Appendix A. Piezometers were also developed by Geraghty & Miller on November 8, 1995. Development was performed using a surge block and teflon bailer. Since groundwater quality was not an issue in the piezometers, no turbidity measurements were taken. All development water was contained in 55-gallon drums, labeled and staged adjacent to the permanent decontamination pad, and disposed of as detailed in Section 4.2.2.3.

#### 4.2.2.2 Monitoring Well/Piezometer Surveying

Monitoring Wells MW-6S/MW-6D through MW-13S/MW-13D, piezometers P-1S/P-1D, as well as preexisting wells T-3, MW-2A, and MW-3, were surveyed by Geraghty & Miller on July 17, 1995. Top of casing (TOC) and ground elevations were surveyed to an accuracy of 0.01 feet using an auto-level and stadia rod. Well T-4 was used as the benchmark for this survey. TOC and ground elevation data is included on Table 2-1, 2-2, and 2-3. Plumb Tuckett & Associates (Plumb Tuckett) of Merrillville, Indiana, re-surveyed MW-6S/MW-6D through MW-14S/MW-14D and the piezometers on January 8, 1996. A permanent benchmark was established at the site for future reference using Global Positioning Satellite (GPS) and both horizontal coordinates (Indiana State Plane West) and vertical elevations were surveyed at each location. Following the installation of the Outlot A monitoring wells, Plumb Tuckett surveyed in MW-15S, MW-16S/MW-16D, and MW-17S/MW-17D on May 21, 1996 using the referenced benchmark. The TOC and ground elevation results for MW-6S/MW-6D through MW-17S/MW-17D and the piezometers are included on Table 2-4. The survey data, including horizontal coordinates, are included as Appendix K.

### 4.2.2.3 Decontamination of Drilling and Sampling Equipment

All drilling equipment in contact with sediments or groundwater including augers, rods, split-spoon samplers, and tools were hot pressure washed at the on-site decontamination pad prior to drilling. Equipment was also hot pressured washed on the permanent decontamination pad between each borehole, and prior to leaving the site. All on-site steam cleaning activities were monitored by the hydrogeologist.

Split-spoon samplers, and the submersible pump and surge block used for well development, were decontaminated prior to use at each location. Clean, disposable gloves were worn while equipment was cleaned to avoid contamination. Equipment was cleaned of extraneous sediment, and washed with a two percent solution of Alconox soap and deionized water in a bucket. Equipment was scrubbed with a brush to remove any adhering particles and rinsed with potable water, followed by a thorough rinsing with deionized water. The cleaned equipment was reassembled if necessary and placed on a clean polyethylene sheet.

Prior to groundwater sample collection at each monitoring well, all sampling equipment was decontaminated. Disposable gloves were worn and changed frequently while the equipment was cleaned to avoid contamination. The procedure for cleaning the sampling equipment prior to collecting a sample for chemical analysis was as follows:

1. Polyethylene sheeting was laid on the ground adjacent to the monitoring well, all clean sampling and decontamination equipment were placed on this plastic.

2. A two percent solution of Alconox and distilled water was prepared in a dedicated bucket. A distilled water rinse was prepared in another dedicated bucket.

Laboratory grade deionized water was poured into a clean (pre-rinsed with deionized water) spray bottle.

3. The disassembled teflon bailers, water level tape and probe, field-filter vessel, and any other equipment in contact with the groundwater were immersed in the Alconox solution and scrubbed with a brush to remove any adhering particles.

4. All equipment was then rinsed with distilled water, followed by a thorough rinsing with deionized water.

5. Cleaned bailers were reassembled and placed on a clean polyethylene sheet.

In the second phase of groundwater characterization, samples were collected using the low flow purging technique outlined below in Section 4.2.5. This technique minimized the amount of equipment which required decontamination. However, hose clamps and center weights which were used at each location were cleaned according to the procedure described above. Dedicated tubing and other equipment were assembled on a clean table or plastic sheeting while wearing latex gloves and placed in new plastic bags until installed in the well. All dedicated equipment was disposed of after use at each location.

#### 4.2.2.4 Containment and Disposal of Soil, Decontamination, Development, and Purge Water

Drill cuttings were placed in 55-gallon drums, labeled with the appropriate drilling location, dated, and staged within the fenced landfill area adjacent to the decontamination pad. The disposal of the cuttings was in accordance with applicable laws and regulations. The decontamination water was pumped from the decontamination pad to drums and/or stored within the decontamination pad

holding tank. After receiving the analytical characterization and subsequently, permission from the Sanitary Sewer District of Hammond, the decontamination water, as well as development and purge water were discharged to an on-site sanitary sewer line on November 17, 1995. The decontamination, development, and purge water were evacuated from the decontamination pad holding tank and 55-gallon drums using a vacuum truck supplied by Best Environmental, Inc. of Channahon, Illinois. The water was then discharged directly from the vacuum truck at a sanitary sewer manhole located at the site.

### 4.2.3 Groundwater Sampling/Initial Phase

The eight monitoring wells in the four nests located near the downgradient edge of the facility (MW-10S/MW-10D, MW-11S/MW-11D, MW-12S/MW-12D, and MW-13S/MW-13D) were sampled and analyzed for the inorganic Appendix IX constituents plus fluoride, Appendix IX VOCs, and Appendix IX SVOCs. The eight monitoring wells in the four nests adjacent to the landfill (MW-6S/MW-6D, MW-7S/MW-7D, MW-8S/MW-8D, MW-9S/MW-9D) were sampled for all of the Appendix IX constituents plus fluoride. All samples, with the exception of dioxins/furans, were submitted to Quanterra Environmental Services (Quanterra) laboratory in North Canton, Ohio for analysis. Samples for dioxins and furans were submitted to Quanterra in West Sacramento, California.

Geraghty & Miller performed the required groundwater sampling of monitoring wells on July 18 through August 2, 1995. The background monitoring wells MW-6S/MW-6D were sampled first. Prior to sampling, the depth to water was measured as described in Section 4.2.2. Total well depth was also measured and the volume of water in the casing was calculated. Depths to water, total depths, and casing volumes are included on the Water Sampling Logs as Appendix L.

Monitoring wells were purged of five well volumes using a decontaminated single check valve teflon bailer. A new section of polypropylene rope was used for the bailer at each well. All

sampling equipment was decontaminated following the procedures outlined in Section 4.2.2.2. The purged water was contained in 55-gallon drums, labeled, and staged adjacent to the decontamination pad. Disposal of the purge water was performed on November 17, 1995 as detailed in Section 4.2.2.3 above. Immediately after purging five casing volumes from each well, field measurements of the groundwater were measured for pH, temperature, and specific conductance. These measurements were collected using a HyDac Model 910 field conductivity-temperature-pH meter. Calibration of the meter for specific conductance and pH were made daily using a conductivity solution and buffer solutions of pH 7.01 and pH 10.01. Measurements for pH, temperature, and specific conductance in groundwater are included on the Water Sampling Logs (Appendix L).

Following evacuation of the required purge volume, the wells were sampled with a Teflon bailer. Surgical gloves were worn by all sampling personnel while handling sampling equipment and containers. Gloves were changed often at each location, and a new pair of gloves were worn at each well. The shallow monitoring wells were sampled using the same single check valve bailer employed for purging. At each shallow well, no intermediate decontamination of the bailer was performed. The deep monitoring wells were sampled with a double check valve teflon bailer to allow for discrete sample collection from near the base of the aquifer. Sample bottles were filled in succession from the same bailer and each consecutive bailer until the required sample volume was collected. Sample bottles for each parameter (where applicable) were filled in the following order:

1. Volatile organics
2. Semi-volatile organics
3. Dissolved metals
4. Sulfide
5. Remaining Appendix IX inorganic constituents

VOC sample containers were pre-preserved at the laboratory. Sample containers for VOCs were filled to eliminate headspace. Preservatives (as required) were added to each sample immediately following sample collection. Dissolved metals samples were field filtered through a one-use disposable 0.10 micron filter (Millipore Corporation, Millipak 20 0.1u sterile) using a pressure vessel and hand pump. The dissolved metals sample was poured directly from the bailer into the pressure vessel. Filtering was performed after all other sample bottles for one well were filled. Five of the disposable 0.10 micron filters were labeled, shipped to Quanterra, and pre-weighed at the laboratory. In addition, several 0.45 micron disposable filters were also shipped to the laboratory for pre-weighing. The use of 0.45 micron filters was anticipated due to suspended solids in some wells. If the 0.45 micron filter was required as a pre-filter, then both filters were submitted for final weight determination. Following field filtering, these filters were labeled, placed in plastic bags, sealed, and shipped with chain-of-custody to Quanterra for post filter weight determination. Each sample container was labeled with sample identification, date and time of collection, and analysis to be performed and immediately cooled down at each wellhead by placing the samples on ice in a cooler.

#### 4.2.3.1 Quality Control Sample Collection

Replicate and blank samples were used to monitor sampling and laboratory performance. To ensure unbiased handling and analysis by the laboratory, the identity of replicate samples were disguised by means of coding. Results for the duplicate samples, trip blanks, equipment blanks, and MS/MSD samples are included on Tables 4-8 through 4-14. The laboratory analytical results, chain-of-custody documentation, and data validation summary reports are included as Appendix M.

Duplicate samples were collected from MW-7S on July 28, 1995 (Sample I.D. FMGWMW58) and from MW-9S on August 2, 1995 (Sample I.D. FMGWMW61). These duplicate samples were analyzed for all Appendix IX parameters plus fluoride.

Trip blanks, prepared by the laboratory, consisted of 40 ml vials containing reagent grade deionized water. Trip blanks were utilized only in association with aqueous VOCs samples and were used at a frequency of one trip blank per cooler of samples containing VOC samples. Trip blanks were analyzed with the samples for VOCs to detect whether samples have been contaminated as a result of handling in the field, during shipment, or in the laboratory.

Equipment blanks (including filtration blanks for dissolved metals) were collected on July 28 (Sample I.D. FMGWMW59) and August 2, 1995 (Sample I.D. FMGWMW60). These blanks consisted of reagent grade deionized water (supplied by the laboratory) poured over the decontaminated sampling equipment and where applicable, through the filtering apparatus.

As part of the internal laboratory control checks specified by the RFI Workplan, MS/MSD analyses were performed by the laboratory. MS/MSD analyses were performed for samples MW-8S and MW-9D.

### 4.2.4 Groundwater Analytical Results/Initial Phase

Groundwater analytical results are compared in this report to both Maximum Contaminant Levels (MCLs) established under the Safe Drinking Water Act and to background. A table of MCL groundwater criteria are included in Appendix I. Although groundwater encountered at the site is not used as a potable water supply in the area, established MCLs form a basis for comparison of regulatory levels with on-site groundwater analytical results.

#### 4.2.4.1 Volatile Organic Compounds

Groundwater samples were analyzed for VOCs by USEPA SW846 Method 8240A. VOC analysis was performed for groundwater collected at all monitoring wells. The analytical results are

summarized on Table 4-9. The laboratory analytical results and chain-of-custody documentation as well as the data validation summary reports are included as Appendix M. Those VOCs detected in groundwater are displayed on Figure 4-6.

The laboratory reported acetone in samples from MW-6S, MW-6D, MW-7D, and MW-12S at estimated concentrations ranging from 3.4 to 16 ug/L. Acetone was also detected in the equipment blank collected on July 28, 1995 and in the trip blank for MW-8S. Estimated concentrations of acetone in the blanks range from 2.2 to 14 ug/L. Based on the results of data validation, acetone was determined to be a laboratory artifact and all data are flagged as not detected. Two additional VOCs detected in groundwater were trichloroethene (TCE) and total 1,2 dichloroethene (DCE) at MW-12S. Concentrations of these two compounds were 22 ug/L and 100 ug/L, respectively. Geraghty & Miller collected an additional sample from MW-12S for VOC analysis on November 3, 1995 using the sampling procedures and analytical methodology detailed above. However, Geraghty & Miller requested that Quanterra provide a report for cis-1,2-DCE and trans-1,2 DCE instead of total 1,2 DCE. The results of this analysis are included in the laboratory report in Appendix M. The VOCs detected in this sample were TCE at 4.5 ug/L (estimated value, below the quantitation limit of 5.0 ug/L), trans-1,2 DCE at 12 ug/L, and cis-1,2 DCE at a concentration of 58 ug/L.

4.2.4.1.1 Comparison of VOCs to Background and MCLs

The only VOCs detected in groundwater above background were trichloroethene (TCE) and total 1,2 dichloroethene (DCE). 1,2 DCE (total) was subsequently analyzed for trans-1,2 DCE and cis-1,2 DCE.

The analytical results for VOCs in groundwater were compared to those VOCs that have MCLs established for drinking water. TCE was detected at MW-12S at a concentration of 22 ug/L. The MCL for this compound is 5.0 ug/L. Also at MW-12S, 1,2-DCE (total) was detected

at a concentration of 100 ug/L. There is no MCL for total 1,2-DCE. The MCLs established for cis-1,2-DCE and trans-1,2-DCE are 70 and 100 ug/L, respectively. Geraghty & Miller resampled MW-12S and requested that the laboratory provide a report for cis-1,2-DCE and trans-1,2 DCE instead of total 1,2-DCE. The analytical results for cis-1,2-DCE and trans-1,2-DCE in the subsequent sample were 58 ug/L and 12 ug/L, respectively. Both compounds are below the respective MCLs.

#### 4.2.4.2 Semi-Volatile Organic Compounds

Groundwater samples were analyzed for SVOCs by USEPA SW846 Method 8270A at all monitoring well locations. The analytical results are summarized on Table 4-10. The laboratory analytical report, chain-of-custody documentation, and data validation summary reports are included as Appendix M. SVOC analysis for two samples, MW-11S and MW-11D, were reextracted and reanalyzed due to an out of control QA parameter. The reextraction/reanalysis was performed outside of the specified holding time. Therefore, the SVOC results for these samples are estimated (Appendix M). The results from both extractions and analysis for MW-11S were compared. There was not a significant difference in either case. Since all SVOCs detected in MW-11S were quantified below reporting limits and were therefore estimated, the data for MW-11S are qualified as estimated and not detected. Those SVOCs detected in groundwater are displayed on Figure 4-7.

SVOCs detected in groundwater at the site include pentachlorophenol, fluoranthene, pyrene, naphthalene, and bis(2ethylhexyl)phthalate. With the exception of bis(2ethylhexyl)phthalate, detected at MW-11D at an estimated concentration of 13 ug/L, all of these compounds were detected at concentrations below each compounds respective quantitation limit's, and therefore are reported as estimated values. The concentration of bis(2ethylhexyl)phthalate detected at MW-11D was estimated based on data validation as described above. In addition to MW-11D, bis(2ethylhexyl)phthalate was detected at MW-6S, MW-6D, MW-7S, MW-7D, MW-8S, MW-

11D, MW-12D, MW-13S, MW-13D, and in the equipment blank collected on July 28, 1995. Estimated concentrations for this compound range from 0.73 ug/L in the equipment blank to 8.8 ug/L at MW-12D. Pentachlorophenol was detected at MW-6D, MW-8D, and MW-12S. Estimated concentrations range from 3.4 ug/L at MW-8D to 4.1 ug/L at MW-6D. In addition to the estimated concentration of bis(2ethylhexyl)phthalate detected at MW-8S, this well also showed fluoranthene and pyrene at estimated concentrations of 1.1 ug/L for both compounds. Fluoranthene and naphthalene were detected at estimated concentrations of 1.3 and 2.3 ug/L, respectively at MW-11S.

4.2.4.2.1 Comparison of SVOCs to Background and MCLs

Bis(2ethylhexyl)phthalate was detected in both shallow and deep background wells at estimated concentrations of 6.3 and 3.9 ug/L, respectively. SVOCs detected in groundwater above background at the site include fluoranthene, pyrene, bis(2ethylhexyl)phthalate and naphthalene.

The analytical results for SVOCs in groundwater above background were compared to those SVOCs that have MCLs established for drinking water. Bis(2ethylhexyl)phthalate was detected above the MCL of 6 ug/L at estimated concentrations in MW-6S, MW-8S, MW-11D, and MW-12D. Estimated concentrations in these wells range from 6.3 ug/L in the background well (MW-6S) to 13 ug/L at MW-11D. This compound is a common plasticizer and well known sampling artifact (potential sampling sources are bailers, PVC well casing, bailer rope, etc.). Bis(2ethylhexyl)phthalate also occurred in the shallow background well as well as the equipment blank.

**4.2.4.3 Total Metals Analysis**

Groundwater sampling included analysis for total metals at all monitoring well locations. Total metals analyses include silver, barium, beryllium, cadmium, cobalt, chromium, copper,

nickel, antimony, tin, vanadium, zinc, arsenic, lead, mercury, selenium, and thallium. Analytical methodologies for specific metals were performed as specified in the RFI Workplan. Methodologies for specific metals are included in the laboratory analytical report. The analytical results for total metals are summarized on Table 4-11. The laboratory analytical results and chain-of-custody documentation as well as the data validation summary reports are included as Appendix M. Total metals detected at or above the quantitation limits are displayed on Figure 4-8.

Silver, beryllium, selenium, and thallium were below quantitation limits at all monitoring wells. The post digestion spikes for the majority of the dissolved selenium and thallium fell between 40-85% while the sample results were less than one-half the reporting limit. Elevated detection limits were noted for several of the samples submitted for selenium and thallium as noted on Table 4-11. None of the metals were detected in the equipment blanks.

Barium concentrations were detected in all samples except MW-11S. Where detected, barium concentrations range from 150 ug/L at MW-13S to 815 ug/L at MW-9S. Cadmium was detected in groundwater at MW-8S, MW-9S, MW-10S, and MW-11S. Based on data validation, the results for cadmium at MW-9S and MW-10S were estimated (Appendix M). Concentrations range from an estimated 10.5 ug/L at MW-10S to 53.1 ug/L at MW-11S. Cobalt was detected only at MW-11D at a concentration of 59.8 ug/L. Chromium was detected at all locations except the duplicate sample from MW-7S and the sample from MW-13S. Concentrations of chromium range from 19.5 ug/L at MW-6S to 90 ug/L at MW-8S. Based on data validation, the results for chromium in the duplicate sample for MW-9S were estimated (Appendix M). Copper was detected in groundwater at all monitoring wells except MW-6S with concentrations ranging from 61.4 ug/L at MW-6D to 9,950 ug/L at MW-8S. Based on data validation, concentrations of copper were estimated for MW-7D and MW-12S. Nickel was not detected at MW-6S, MW-12S, and MW-13S. Where detected, concentrations of nickel range from 46.2 ug/L at MW-7D to 1,240 ug/L at MW-8S. Antimony was detected only at MW-8S at a concentration of 714 ug/L. Tin concentrations

were detected only at MW-7S, MW-8S, and MW-11S and range from 537 ug/L at MW-11S to 2,310 ug/L at MW-8S. Vanadium was not detected in MW-6S, MW-7S, MW-7D, in the duplicate sample collected at MW-9S, MW-12S, MW-12D, and MW-13S. Where detected total concentrations of vanadium range from 63.1 ug/L at MW-13D to 149 ug/L at MW-11D. Total zinc, arsenic and lead were detected in groundwater at all monitoring well locations. Based on data validation results, concentrations of zinc were estimated for MW-7S, MW-9S, the duplicate for MW-9S, and MW-11S; concentrations for arsenic were estimated for MW-11S; and lead concentrations were estimated for MW-7S, the duplicate for MW-7S, MW-7D, and MW-12D (Appendix M). Total zinc concentrations range from 88.6 ug/L at MW-6S to 16,100 ug/L at MW-8S. Total concentrations of arsenic range from 14.3 ug/L at MW-6S to 437 ug/L at MW-11D and concentrations of lead range from 19.4 ug/L at MW-6S to 10,400 ug/L at MW-8S. Total mercury was detected at MW-7S, MW-7D, MW-9S, MW-10S, MW-11S, and MW-11D. Where detected, total mercury ranges from a concentration of 0.0038 at MW-7S and in the duplicate sample from this well to 4.3 ug/L at MW-7D.

4.2.4.3.1 Comparison of Total Metals to Background and MCLs

With few exceptions, total metals in groundwater are elevated in downgradient wells when compared to the background wells. Exceptions to this are for total barium and chromium in groundwater. Barium concentrations in the shallow and deep background wells were 242 and 374 ug/L, respectively. With the exception of MW-8S, 9S, 10S, 10D, and 11D, barium concentrations in the downgradient wells are less than background. Chromium was detected in the deep background well at a concentration of 50.3 ug/L. Concentrations of total chromium in downgradient wells MW-7D and MW-12D were less than background.

The analytical results for total metals exceeding background in groundwater were compared to those metals that have MCLs established for drinking water. Total cadmium concentrations detected at MW-8S, MW-9S, and the duplicate for MW-9S, MW-10S, and MW-11S range from an

estimated 10.5 ug/L to 53.1 ug/L and exceed the MCL established for cadmium of 5 ug/L. Total chromium was detected above the MCL of 100 ug/L in one sample, MW-11D. Chromium at this well was detected at 111 ug/L. Total antimony was detected at MW-8S at a concentration of 714 ug/L. The MCL for this metal is 6 ug/L. The MCL for arsenic (50 ug/L) was exceeded at MW-7S (and MW-7S duplicate), MW-8S, MW-9S (and MW-9S duplicate), MW-10S, MW-10D, and MW-11D. Arsenic concentrations in these wells range from 60.5 ug/L at MW-7D to 437 ug/L at MW-11D. The MCL for mercury in groundwater is 2 ug/L. Total mercury was detected at concentrations above the MCL at MW-7D (4.3 ug/L) and MW-11D (3.2 ug/L). There is no MCL established for lead, therefore a treatment-based standard, generally set at 15 ug/L, was used for comparison. The treatment based standard for total lead was exceeded in all wells, including the shallow and deep background monitoring wells. Interpretation of the total metals data is difficult since, in general, all water samples contained sediment. Sediment in water samples are known to elevate the apparent concentrations of metals above the available, dissolved concentrations. This relationship is especially egregious for groundwater.

#### 4.2.4.4 Dissolved Metals Analysis

Groundwater sampling included analysis for dissolved metals at all monitoring well locations. Field filtering for dissolved metals was performed by Geraghty & Miller using 0.10 micron disposable filters. At MW-8D, suspended solids in the well required pre-filtering the sample with a 0.45 micron filter followed by 0.10 micron filtering. Both 0.45 micron and 0.1 micron disposable filters were pre-weighed by Quanterra. These pre-weighed filters, designated Filters #1 through #6 on Table 1 in Appendix M, were shipped back to Quanterra following field filtering and the laboratory determined the dry post weight of each filter. Filters #1 (0.45 micron), #4, and #5 were submitted for MW-8D. The 0.45 micron filter was used as a prefilter, followed by two 0.10 micron final filters. The first 0.10 micron filter used at MW-8D clogged and a second filter was required to collect the necessary sample volume at this location. Filters #2, #3, and #6 were all 0.10 micron filters and were submitted for MW-7S, MW-7D, and MW-9D, respectively.

The initial and final weight difference for Filters #1, #4, and #5 at MW-8D (sum of the difference for all three filters) was 50.75 grams. The initial and final weight differences for MW-7S, MW-7D, and MW-9D were 3.74, 6.15, and 15.16 grams, respectively.

Analysis for dissolved metals include silver, barium, beryllium, cadmium, cobalt, chromium, copper, nickel, antimony, tin, vanadium, zinc, arsenic, lead, mercury, selenium, and thallium. Analytical methodologies for specific metals were the same as for total metals and performed as specified in the RFI Workplan. Methodologies for specific dissolved metals are included in the laboratory analytical report. The analytical results are summarized on Table 4-12 and the laboratory analytical results, chain-of-custody documentation, and data validation summary reports are included in Appendix M. Dissolved metals that were detected at or above the quantitation limits are displayed on Figure 4-9.

Analyses for dissolved silver, beryllium, cobalt, chromium, antimony, tin, vanadium, selenium, and thallium were all below quantitation limits at each monitoring well location. The post digestion spikes for the majority of the dissolved selenium and thallium samples, as well as two lead samples, fell between 40-85% while the sample results were less than one-half the reporting limit. Quanterra reported an elevated detection limit for dissolved selenium in the MW-9D sample (Table 4-12). No dissolved metals were detected in the equipment blanks.

Dissolved barium concentrations were detected in all samples with concentrations ranging from 51.5 ug/L at MW-11D to 249 ug/L at MW-6D. Dissolved cadmium was detected only at MW-11S at a concentration of 11.3 ug/L. Copper was detected in groundwater at MW-7S, MW-10D, and MW-11S. Concentrations in these three wells range from 12.4 ug/L at MW-11S to 18.9 ug/L in the duplicate sample for MW-7S. Dissolved nickel was detected only at MW-11S and MW-11D at concentrations of 59.8 and 40.9 ug/L, respectively. Dissolved zinc concentrations were detected in groundwater at all locations except MW-7D, MW-9S (zinc detected in the

duplicate sample for MW-9S at a concentration of 61.3 ug/L), MW-9D, and MW-12D. Where detected, concentrations range from 50 ug/L at MW-6D to 2,220 ug/L at MW-11S. Dissolved arsenic was detected at all monitoring wells except MW-6D and MW-11S. Concentrations of dissolved arsenic range from 6.2 ug/L at MW-8S to 370 ug/L at MW-11D. Dissolved lead concentrations were detected at MW-8S, MW-9S, MW-9D, and MW-11S. Concentrations of lead in these wells range from 7 ug/L at MW-9D to 12.7 ug/L at MW-11S. Dissolved mercury was detected only at MW-11D at a concentration of 2.6 ug/L.

4.2.4.4.1 Comparison of Dissolved Metals to Background and MCLs

With few exceptions, concentrations of dissolved metals (where detected) in downgradient groundwater is higher than detected in background wells. Exceptions to this are for barium, zinc, and arsenic. Dissolved barium concentrations in the shallow and deep background wells were 230 and 249 ug/L, respectively. In every instance, barium concentrations in the downgradient wells are less than background. Dissolved zinc concentrations in the shallow and deep background wells are 103 and 50 ug/L, respectively. With the exception of MW-8S, 10S, 11S, 8D, 10D, 11D, and 13D, zinc concentrations in downgradient wells are less than background. Dissolved arsenic concentrations are less than background (7.1 ug/L at MW-6S) in downgradient wells MW-8S and MW-11S.

The analytical results for dissolved metals in groundwater above background were compared to those metals that have MCLs established for drinking water. Cadmium was detected at MW-11S at a concentration of 11.3 ug/L and exceeds the MCL of 5 ug/L. The MCL for arsenic (50 ug/L) was exceeded at MW-9S (and MW-9S duplicate), MW-10D, and MW-11D. Dissolved arsenic concentrations in these wells range from 62.8 ug/L at MW-9S to 370 ug/L at MW-11D. The MCL for mercury in groundwater is 2 ug/L. Dissolved mercury was detected at MW-11D at a concentration of 2.6 ug/L. The treatment-based standard for lead in drinking water is generally 15

ug/L. Concentrations of dissolved lead in groundwater at the site were below this treatment-based standard.

The results are clearly different for metals in groundwater when comparing the filtered versus the unfiltered samples. Cadmium at MW-11S, mercury at MW-11D, and arsenic at MW-9S, MW-10D, and MW-11D were the only dissolved metals detected at MCL exceedances in the filtered samples. The results of the waste type sampling, however, indicated no TCLP exceedances for arsenic.

#### 4.2.4.5 Fluoride, Sulfide, and Total Cyanide (Wet Chemistry) Analyses

Groundwater sampling included analysis for fluoride, sulfide, and total cyanide at all monitoring wells. Fluoride analysis was potentiometric, using an ion selective electrode (Method MCAWW 340.2). Sulfide was analyzed by Method MCAWW 376.1, and total cyanide was analyzed by USEPA SW 846 Method 9012. The analytical results for total fluoride, sulfide, and total cyanide are summarized on Table 4-13. The laboratory analytical report, chain-of-custody documentation, and data validation summary reports are included as Appendix M. Concentrations for these three parameters that were detected at or above the quantitation limits are displayed on Figure 4-10.

Total cyanide was not detected in groundwater at the site. Sulfide was detected at or above the quantitation limits in samples collected from MW-9D, MW-11S, MW-11D, and MW-12D at concentrations ranging from 740 ug/L at MW-11S to 1,100 ug/L at MW-9D. Fluoride was detected at all monitoring well locations with concentrations ranging from 1,200 ug/L at MW-6S to 27,000 ug/L at MW-8D. None of the compounds were detected in the equipment blanks. The MCL for fluoride is 4,000 ug/L. Fluoride concentrations (unfiltered samples) in all monitoring wells except MW-6S and MW-12S exceed the MCL for this compound.

#### 4.2.4.6 Chlorinated Herbicides, Organophosphorus Compounds, Pesticides/PCBs, and Dioxins/Furans Analyses

The eight monitoring wells in the four nests adjacent to the landfill (MW-6S/MW-6D, MW-7S/MW-7D, MW-8S/MW-8D, MW-9S/MW-9D) were sampled for all of the Appendix IX constituents plus fluoride. In addition to the those analyses discussed in Sections 4.2.4.1 through 4.2.4.5, these eight wells were sampled for chlorinated herbicides by USEPA SW846 Method 8150A, organophosphorus compounds by USEPA SW846 Method 8141, pesticides/PCBs by USEPA SW846 Method 8080, and dioxins/furans by USEPA SW846 Method 8280.

The analytical results for organophosphorus compounds are summarized in Table 4-13. The analytical results for chlorinated herbicides and pesticides/PCBs are summarized in Table 4-14. Dioxins and Furans are summarized on Table 4-15. The laboratory analytical results and chain-of-custody documentation as well as the data validation summary reports are included in Appendix M. None of these compounds were detected in groundwater samples or the equipment blanks.

#### 4.2.4.7 Groundwater Analytical Results Data Management

Geraghty & Miller completed data entry for all groundwater analytical results obtained for the RFI to date. This data was entered into the USEPA Groundwater Information Tracking System Software (GRITS) program. A diskette with the complete data set was forwarded to USEPA on December 15, 1995.

### 4.2.5 Groundwater Results Summary/Initial Phase

Chlorinated herbicides, pesticides/PCBs, organophosphorus compounds, and dioxins/furans were not detected in groundwater at the site. Historical data collected for the site suggest these compounds were never used at the facility. The groundwater sampling results support the historical data and any future groundwater sampling should omit these analyses. In addition, total cyanide

was not detected in any of the groundwater samples. This constituent was detected in only one soil sample at SWMU #3, from SB-14 (5 to 7 feet), at a concentration of 0.34 mg/kg and in only one waste sample from SWMUs #1 and #2, at a concentration of 0.42 mg/kg. Total cyanide should be omitted from any future groundwater sampling at the site.

VOCs detected in groundwater were TCE, and 1,2-DCE (total). TCE and 1,2-DCE (total) were detected only at MW-12S. The concentration of TCE exceeded the MCL. MW-12S is located downgradient of SWMUs #9 and #10. Both SWMUs are potential sources for these two compounds in groundwater.

The only SVOC in groundwater that was detected above background and the MCL was bis(2ethylhexyl)phthalate. The MCL for this compound is 6 ug/L. Bis(2ethylhexyl)phthalate was detected in MW-6S, MW-8S, MW-11D, and MW-12D at estimated concentrations ranging from 6.3 ug/L in the background well (MW-6S) to 13 ug/L at MW-11D. This compound is a common plasticizer and well known sampling artifact (potential sampling sources are bailers, PVC well casing, bailer rope, etc.). Bis(2ethylhexyl)phthalate also occurred in the shallow background well as well as the equipment blank.

Total metals detected in groundwater above MCLs, or in the case of lead, concentrations above the treatment-based standard, were cadmium, chromium, arsenic, mercury, and lead. Dissolved metals analyses show exceedances of MCLs for cadmium, arsenic, and mercury.

With the exception of arsenic and mercury, which form multi-atom ions of high solubility relative to their respective MCL, the results of unfiltered versus filtered samples are clearly different for metals in groundwater. Groundwater containing sediment in conjunction with field preservation techniques for unfiltered samples (addition of nitric acid to unfiltered samples will dissolve metals from solids and dislocate adsorbed metals) would be expected to have higher

concentrations of metals than the unfiltered samples. Turbidity levels in the monitoring wells at the site are generally above the physical primary standard for turbidity (1 turbidity unit) for a drinking water supply. As an alternative to filtered versus non-filtered comparisons, it appears that using a low flow technique to minimize the disturbance of particulate matter in the well is appropriate for the site. Details of this methodology and the results are provided in Section 4.2.6.

Fluoride concentrations in all monitoring wells except MW-6S and MW-12S exceed the MCL for this compound. However, it should be noted that the samples were unfiltered (as specified by the methodology). Also, the fluoride concentration detected in the deep background monitoring well exceeds the MCL. This fact suggests that to an extent, elevated concentrations of fluoride in groundwater may occur naturally and/or the elevated fluoride concentrations, particularly at MW-6D, may be indicative of an off-site source(s), however, waste materials encountered at the site are the probable sources. Further discussion of this issue is included in Section 4.2.9.

### 4.2.6 Low Flow Groundwater Sampling/Second Phase

During the second phase of characterization, groundwater samples were collected from monitoring wells MW-10S/MW-10D, MW-11S/MW-11D, and the downgradient wells MW-15S, MW-16S/MW-16D and MW-17S/MW-17D, analyzed for total metals plus fluoride, using a low flow technique to minimize the disturbance of particulate matter in the well. Because the presence of any disturbed particulate matter in a groundwater sample will have an effect on the analytical results for total metals, Kearl and others (1994) recommend using a low flow procedure to obtain representative samples of the total mobile metal load in the groundwater, which includes the dissolved and colloidal portions. The disturbance of the particulate matter in the well is minimized by using a pump to purge and sample the well. This methodology, as detailed below, was presented in the USEPA approved Addendum to the RFI Workplan.

In addition to low flow sampling for metals and fluoride, samples were collected for VOC analysis from MW-12S and MW-15S. Since the low flow technique employed at the site involved the use of a peristaltic pump (potential for volatilization of groundwater samples exists using this type of pump), a bailer was used for VOC sample collection at these two wells following the same procedures detailed in Section 4.2.3. VOC sample collection at MW-15S was performed approximately 24 hours after low flow sampling was completed at this well.

Low flow groundwater samples were collected on May 29 and 30, 1996. VOC samples were collected from MW-12S and MW-15S on May 29 and May 30, 1996, respectively. All samples were submitted to Quanterra in North Canton, Ohio and analyzed in accordance with the approved RFI Addendum Workplan. Depths to water, total depths, and casing volumes are included on the Water Sampling Logs as Appendix L.

The low flow sampling technique employed at the site involved the pre-installation of appropriate materials in the well, followed by purging and sampling with a peristaltic pump at a low flow rate (approximately 100 milliliters/minute)(Kearl and others., 1994). Five tubes were installed in each of the designated wells on May 28, 1996. Sampling began on May 29, and continued through May 30, 1996, using the low-flow technique detailed below:

- Prior to sampling, the water level and total depth were measured in each well. Measurements were recorded in the project field book. *Note:* A *complete round of water levels was collected from the entire monitoring well network prior to sampling any of the wells.*

- The well construction log was reviewed to determine the depth of the well screen, midpoint below the top of casing, and the total depth of the well. All observations, calculations were recorded in the field book.

- The measurement of total depth of the well was compared to the well construction log and previous measurements, if any, to determine available length of well screen.

- Prior to installing sample tubing in the well, a decontaminated stainless steel centralizer weight was attached to the influent tubing end. The centralizer was required to prevent contact of the influent end of the tubing with the sides of the monitoring well during installation. The centralizer weight also allowed the influent tubing end to be placed at the appropriate sample depth.

- The dedicated tubing equipped with a decontaminated centralizer was installed into the well from the top of the casing and extended to the midpoint of the well screen. The installation time was recorded in the project field book. After the tubing installation, the well was left undisturbed for a minimum of 4 hours prior to sampling.

- The peristaltic pump was started at the lowest possible flow rate and adjusted to approximately 100 mL/min. The flow rate was verified by collecting the water from the discharge line into a graduated cylinder for one minute, and recorded. Collected water was managed according to the RFI Workplan.

- The water level was monitored using an electric water level indicator to verify that little or no drawdown was occurring in the well. The flow rate was kept at or below 100 mL/min with no measured drawdown.

- Two submerged tube volumes of water were removed at a flow rate of approximately 100 mL/min using the pump and transfer tubing. Purge volume target and actual were recorded in the field book.

- The sample was then collected at a low flow rate (100 mL/min or less) directly into the appropriate sample container(s) for laboratory analysis.

- The pump was then turned off. The dedicated tubing was removed from the well and the centralizer and clamps were decontaminated following procedures in the RFI Workplan. The tubing was discarded, the well was capped and the protective casing was locked.

#### 4.2.6.1 Low Flow Quality Control Sample Collection

A duplicate and equipment blank were collected during low flow sample collection to monitor the sampling methods and laboratory performance. A duplicate sample was collected from MW-16D (Sample I.D. FMGWMW-Z) on May 29, 1996, for total metals and fluoride analyses. An equipment blank was also collected on May 29, for total metals and fluoride analyses (Sample I.D. FMGWMW-Y). The blank consisted of laboratory supplied, reagent grade deionized water, pumped directly from the shipped water container through the centralizer and dedicated tygon tubing assembly into the sample container. As during the first phase of characterization, trip blanks were included in the cooler which included samples for VOCs analysis.

### 4.2.7 Groundwater Analytical Results/Second Phase

During this phase of groundwater investigation, two parameter-specific sampling methods were employed. Samples analyzed for VOCs were collected using a conventional bailing technique. Groundwater samples analyzed for total metals plus fluoride were collected using a low flow sampling technique to minimize the disturbance of particulate matter in the wells. The analytical results for these separate methodologies are summarized below.

#### 4.2.7.1 Volatile Organic Compounds

Groundwater samples collected from MW-12S and downgradient well MW-15S were analyzed for VOCs by USEPA SW846 Method 8240A. The analytical results are summarized on Table 4-16. The results are also displayed on Figure 4-6 along with VOCs results from the first phase of sampling (July-August 1995). The laboratory analytical results and chain-of-custody documentation as well as the data validation summary reports are included as Appendix N.

TCE and 1,2-DCE were detected at respective concentrations of 4.5 ug/L (estimated) and 53 ug/L in the samples collected from MW-12S. Both compounds were also detected during the first phase of sampling. However, concentrations detected at MW-12S were lower in the second sampling than the first (Figure 4-6).

Acetone was the only VOC detected in the sample collected from downgradient well MW-15S, at a concentration of 60 ug/L. Acetone was not detected in the sample from well MW-12S. As stated previously, acetone is a common laboratory artifact.

The concentration of 4.5 ug/L TCE detected in the sample collected from MW-12S is below the TCE MCL of 5 ug/L. The total 1,2- DCE concentration of 53 ug/L detected at MW-12S is below both of the 1,2-DCE MCLs of 70 ug/L (cis) and 100 ug/L (trans).

#### 4.2.7.2 Total Metals and Fluoride

Total metals and fluoride analytical results using the low-flow purging and sampling technique are summarized on Table 4-17. Total metals were analyzed by USEPA SW846 3010A/6010A and fluoride by Method MCAWW 340.2. Detected and estimated concentrations of total metals and fluoride are displayed on Figure 4-11. For comparison purposes, the low-flow versus the conventional sampling technique is included as Table 4-18. This Table shows the second phase results along with the first phase results (which included both dissolved and total metals analyses). The laboratory analytical reports, chain-of-custody documentation, and data validation summary report are included in Appendix N.

Selenium, thallium, silver, beryllium, cobalt, chromium, nickel, antimony, tin, and vanadium were not detected in any of the samples collected. Barium concentrations were detected in all samples and concentrations range from 23.5 ug/L at MW-11D to 133 ug/L at MW-15S. Cadmium was only detected at well MW-11S at a concentration of 464 ug/L. Concentrations

of copper were detected at wells MW-10S, MW-11S, MW-15S and MW-17S and range from 21.7 ug/L at MW-17S to 106 ug/L at MW-15S. According to data validation estimates, zinc was not detected at MW-11D and MW-17D. Zinc was present in the other wells, based on data validation, at estimated concentrations which range from 180 ug/L at MW-16S to 14,800 ug/L at MW-11S. Lead was only detected in wells MW-11S and MW-15S at concentrations of 68.5 ug/L and 4.1 ug/L, respectively. Zinc was detected in the equipment blank at a concentration of 191 ug/L. Wells MW-10S and MW-11S did not contain detectable arsenic concentrations. Arsenic was detected in other wells at concentrations ranging from 9.1 ug/L at MW-16S to 938 ug/L at MW-11D. Mercury was detected at MW-11D, MW-16D and the duplicate sample collected at MW-16D at respective concentrations of 2.4 ug/L, 0.71 ug/L and 0.79 ug/L.

Fluoride was detected in samples collected from all the wells. Concentrations detected range from 1,400 ug/L at MW-15S to 8,700 ug/L at MW-10D.

#### 4.2.7.3 Comparison of Total Metals and Fluoride to MCLs

The analytical results for total metals in groundwater were compared to those metals that have MCLs established for drinking water. The cadmium concentration of 464 ug/L detected at MW-11S exceeds the MCL established for cadmium of 5 ug/L. The Secondary MCL for zinc (5,000 ug/L) was exceeded at MW-11S where an estimated concentration of 14,800 ug/L was detected. Arsenic concentrations in wells MW-10D, MW-11D, MW-16D and MW-17D range from 56.5 ug/L (MW-10D) to 938 ug/L (MW-11D), and exceed the arsenic MCL of 50 ug/L. The MCL for mercury of 2 ug/L was exceeded at MW-11D where 2.4 ug/L mercury was detected. Since no MCL has been established for copper, a treatment-based standard, generally set at 1300 ug/L, was used for comparison. None of the copper concentrations detected exceed the standard. A treatment based standard was also used for comparing lead concentrations, since no MCL for lead has been established. The lead concentration of 68.5 ug/L detected at MW-11S exceeds the 15 ug/L generally set as the lead standard.

The fluoride MCL for drinking water is 4,000 ug/L. Fluoride concentrations at or above the MCL were detected at MW-10D, 11S, 11D, 16S, 16D, and 17D.

MCLs for lead, cadmium and zinc were only exceeded at well MW-11S. The MCL for mercury was only exceeded at well MW-11D. Both of these wells are located on site property. The wells downgradient of MW-11S/D, are located on Outlot A, and include both clusters MW-16S/D and MW-17S/D. Arsenic and fluoride concentrations detected in the deep downgradient wells (MW-16S and MW-17D) exceed the MCLs. Where detected, no other metals analyzed exceed MCLs in the wells downgradient of the site.

#### 4.2.7.4 Comparison of Low-Flow Versus Conventional Sampling Results

In the first phase of sampling, interpretation of the total metals data is difficult since, in general, all water samples contained sediment. Sediment in a water sample is known to elevate the apparent concentrations of metals above the available, dissolved concentrations. Therefore, the samples collected were also filtered in the field and analyzed for dissolved metals. The second phase of sampling utilized low-flow purging which prevents introducing sediment into the sampled groundwater, so that filtering is not required. The water collected is also more representative of the total mobile metal load in the groundwater, which includes the dissolved and colloidal portions (Kearl and others, 1994)

Table 4-18 compares the results of the three sampling techniques. The results where the conventional bailer technique was used to collect samples in 1995 (first phase) for total metals analysis, indicates MCL (or standard) exceedances for arsenic, lead, cadmium, chromium, copper, nickel, zinc, mercury, and fluoride. Samples which were collected concurrently but field filtered (0.01 micron filter), exceed MCLs for arsenic, cadmium, and in one instance,

mercury. Fluoride samples were not filtered. Samples collected using a low-flow purging and sampling technique exceed MCLs for arsenic, lead, cadmium, mercury, zinc, and fluoride.

After considering the random distribution of arsenic, and after evaluating the results of the filtered versus unfiltered versus low-flow sampling, it is apparent that groundwater underlying the site is impacted by several metals and fluoride. The comparison of these results to MCLs show that cadmium, arsenic, mercury, lead, chromium, zinc, and fluoride are present in groundwater above their MCLs.

Additional groundwater sampling incorporating the low-flow sampling methodology for total metals and fluoride should be performed at all on-site wells including the background wells. The results of this sampling event would then form the basis for comparison to applicable standards. The results and comparisons developed from the low-flow groundwater sampling would be used to evaluate remedial alternatives in the CMS.

### 4.2.8 Off-site Groundwater Investigation

An off-site groundwater investigation was conducted by Geraghty & Miller from September 3, through September 27, 1996. Groundwater sampling at off-site locations was performed employing temporary sampling points (TSPs) in both shallow and deep portions of the Calumet Aquifer, north of the facility, to assess the lateral and vertical extent of dissolved arsenic, dissolved zinc, and fluoride in groundwater. TSPs referred to in this section are devices for the collection and analysis of groundwater for the sole purpose of providing preliminary information on the groundwater quality. These TSPs were not installed in accordance with standard RCRA monitoring well installation procedures. Groundwater samples were collected from shallow and deep horizons assumed to be similar to those that exist in the subsurface at the site.

Following the initial phase of groundwater sampling conducted in July/August 1995 (Section 4.2.4), subsequent groundwater sampling, as required by IDEM, was performed monthly at the site beginning in September 1995 and continued through November 1995. In addition, quarterly groundwater sampling was performed at the site in March 1996. These five sampling events included analysis for dissolved arsenic and lead at background wells MW-6S and MW-6D. Lead concentrations in the background wells were always less than the detection limit of 3 ug/L. Arsenic concentrations in the shallow background well (MW-6S) ranged from less than the detection limit of 5 ug/L to 8.1 ug/L. Arsenic concentrations in the deep background well (MW-6D) ranged from less than 5 ug/L to 12.2 ug/L. The dissolved arsenic results from July/August 1995 through March 1996 at MW-6S and MW-6D are summarized in Table 4-19. In order to establish a background concentration for arsenic, all concentrations below the detection limit were assumed to be 2.5 ug/L and a resulting arithmetic mean, median, and standard deviation were calculated (Table 4-19). As a conservative approach for background concentrations of arsenic, the median values and the means plus two times the standard deviations for both shallow and deep wells, 5.1 and 7.9 ug/L (medians), and 11.70 and 16.90 (means plus twice the standard deviations), respectively, were used for comparative purposes.

Based on the results of laboratory analysis and groundwater elevation data collected in March 1996, the process of evaluating concentrations, rate of migration, and horizontal and vertical extent of identified constituents beyond the sewer south of Outlot A, was initiated as required by IDEM. Quarterly groundwater samples were collected in June 1996 from Outlot A wells MW-15S, MW-16S/MW-16D, and MW-17S/MW-17D. Samples were analyzed for dissolved arsenic, lead, copper, and zinc in accordance with IDEM requirements. Samples were field filtered using a 0.45 micron filter. The analytical results are displayed on Table 4-20. Dissolved copper and lead were not detected at any of the Outlot A monitoring wells. Dissolved zinc was detected only at MW-15S, at a concentration of 184 ug/L in the sample and 155 ug/L in the duplicate sample. The

concentration for dissolved zinc during the July/August sampling at MW-6S was 103 ug/L. Dissolved arsenic was detected at all Outlot A monitoring wells at concentrations ranging from 8.1 ug/L at MW-16S to 1,040 ug/L at MW-17D. These concentrations exceed the median values in the background wells. Those arsenic concentrations exceeding the mean plus twice the standard deviation of background were detected at MW-15S, 16D, 17S, and 17D. Concentrations of dissolved arsenic exceeding the maximum contaminant level (MCL) of 50 ug/L for drinking water were detected at MW-16D, 17S, and 17D at concentrations of 74.7, 268, and 1,040 ug/L, respectively. In addition to background exceedances for dissolved arsenic and zinc, groundwater elevation data for all site wells and piezometers suggest that groundwater at the northern edge of Outlot A continues flowing to the north.

#### 4.2.8.1 Off-site Delineation Methodology

In order to further evaluate the concentrations and extent of constituents in groundwater exceeding background levels in on-site monitoring wells, TSPs were utilized to assess the lateral and vertical extent of arsenic, zinc, and fluoride in groundwater. Fluoride is included in the delineation analysis as part of the RFI.

Off-site delineation work was performed from September 3, through September 27, 1996. Twenty (20) TSPs were installed by Stratigraphics of Glen Ellyn, Illinois, using a hydraulic, truck-mounted, direct push sampling device. Geraghty & Miller personnel provided field coordination, oversight, and groundwater sample collection throughout the field work. All off-site work was performed within the right-of-way of the City of Whiting, Indiana, at the locations shown on Figure 4-12.

4.2.8.1.1 Subsurface Characterization

To assess the geology of the Calumet Aquifer at the off-site locations prior to collecting groundwater samples, a CPT penetrometer equipped with a soil EC sensor was hydraulically advanced adjacent to each TSP location. The CPT-EC results are discussed in Sections 2.2.1 and 2.3.1. CPT-EC Logs are included as Appendix B. Objectives using this methodology included identification of the stratigraphic position of the clay located at the base of the aquifer, any significant changes in lithology within the aquifer, and identification of the groundwater table. Since the CPT and EC test data are acquired real time, the results for each location were immediately applied in the field to accurately determine the placement of the adjacent TSP well screens utilized for collecting groundwater samples. Once the CPT-EC test was completed at each location, borings were plugged using bentonite grout. Following retrieval of the rod string and any settling of the grout, the borings were backfilled with granular bentonite to within 3 inches of the surface. The remaining hole was cemented flush with grade.

Each TSP location was surveyed for x, y, and z coordinates by Plumb Tuckett & Associates of Merrillville, Indiana. The off-site survey was tied into the existing site survey. Vertical control data at each location were used to evaluate groundwater flow direction. Horizontal control data will allow for accurate mapping and can be used to locate TSP locations in the future. Survey data is included in Appendix K.

TSP locations, ground elevations, horizontal coordinates, and groundwater elevation data collected during the off-site investigation are included on Table 4-21. As discussed in Section 2.2.1, groundwater elevation data were collected over a period of approximately 3 weeks. In general, water levels were considered at equilibrium when observed water level increases leveled off and remained constant for five minutes. Because of time constraints, equilibrium (static water level) conditions were not achieved at all TSP locations as noted on Table 4-21. The shallow

groundwater elevations at all TSPs where equilibrium conditions were reached, were plotted to evaluate horizontal flow within the aquifer.

4.2.8.1.2 Decontamination Methodology

Decontamination of the penetrometer and groundwater sampling device was achieved by pulling the tools through a rod-washing, decontamination chamber. The chamber is mounted at the base of the hydraulic-thrust cylinders beneath the operating platform of the truck. The rod string is steam cleaned as it passes through the chamber, prior to handling by field personnel. Rubber wipers at the entry and exit of the rod-washing chamber control leaking of decontamination water and wipe soil and grout from the rod string. The groundwater sampler was disassembled and decontaminated with a pressurized steam wash, followed by a non-phosphate detergent wash, fresh water rinse, and a final rinse with laboratory grade deionized water. Decontamination rinsate water was collected and containerized and transported to the site for disposal to the on-site sanitary sewer at a later date.

**4.2.8.2 Off-site Groundwater Sampling**

Following collection of the CPT-EC data at each location, a second boring was advanced approximately 5 feet from the initial CPT boring. In order to assess the vertical extent of arsenic, zinc, and fluoride in the aquifer, two groundwater samples were collected at each TSP location. Initially, the shallow aquifer was sampled at a depth approximately 5 feet below the water table. This depth corresponds to the approximate midpoint of the shallow monitoring well screens installed at the facility. Following sampling of the shallow aquifer, the deep zone was sampled at a depth of 7.5 feet above the base of the aquifer (clay layer). This depth corresponds to the approximate midpoint of the deep monitoring well screens installed at the site.

The sampling device consists of a 1.5 foot length, Schedule-40 PVC, factory cut 10-slot screen. The screen is enclosed within a stainless steel assembly (similar to a Hydropunch sampler) and the sampling device is hydraulically advanced to the appropriate sample depth. Once the sample depth was reached, the well screen was deployed.

Following deployment of the well screen at both shallow and deep sample intervals, depths to water were measured inside the tubing string using an electric water level indicator. Water levels were measured at a frequency sufficient to evaluate when equilibrium (static) conditions have been established. At some locations, equilibrium was not reached prior to sample collection. Once water level data was obtained, dedicated Tygon tubing was employed inside the casing with the tubing intake set at the depth of the well screen. A peristaltic pump was used to evacuate approximately three volumes of water from the drill string rods. Following the purge at each sample interval, a groundwater sample was collected directly from the effluent end of the tubing for laboratory analysis. Fluoride samples were collected first, followed by field filtration and collection of the dissolved arsenic and zinc samples. Field filtration was performed using disposable 0.45 micron filters attached directly to the effluent end of the tubing. Duplicate groundwater samples were collected at TSP-3 (shallow) and TSP-17 (deep) for quality control. Since only dedicated sampling equipment was used, no equipment blanks were collected. Samples were submitted with chain-of-custody to Microbac Laboratory in Hammond, Indiana. Fluoride was analyzed by MCAWW Method 340.2, and dissolved arsenic and zinc samples were analyzed by USEPA SW-846 Methods 3113B and 3111B, respectively.

#### 4.2.8.3 Off-site Groundwater Analytical Results

The analytical results for groundwater samples collected from both the shallow and deep aquifer are summarized in Table 4-22 and displayed on Figure 4-13. The laboratory reports and chain-of-custody are included as Appendix O. Zinc was detected at only one location, in the shallow groundwater at TSP-1, at a concentration of 50 ug/L. Fluoride was detected at all locations

except the deep sample at TSP-12. Where detected, concentrations of fluoride range from 200 ug/L at TSP-11 (deep), TSP-15 (deep), and TSP-20 (deep) to 840 ug/L at TSP-11 (shallow) and TSP-17 (shallow). Arsenic was detected in the shallow groundwater at four TSP locations; TSP-2, 3, 4, and 18. Where detected in the shallow aquifer, arsenic concentrations range from 8.2 ug/L at TSP-4 to 54 ug/L at TSP-18. An isoconcentration map for dissolved arsenic in the shallow groundwater is included as Figure 4-14. Also included on this figure are dissolved arsenic concentrations detected in June 1996 (Table 4-20), at the shallow Outlot A monitoring wells (MW-15S, 16S, and 16D). In the deep portion of the aquifer, arsenic was detected at all TSPs at concentrations ranging from 7.8 ug/L at TSP-19 to 88.6 ug/L at TSP-2.

#### 4.2.8.4 Off-site Groundwater Analyses Summary

Where detected, concentrations of fluoride in off-site groundwater range from 200 to 840 ug/L. These concentrations are well below the MCL of 4,000 ug/L established for fluoride in drinking water. The extent of elevated fluoride concentrations in groundwater related to the site have been defined by the existing data.

The TSP analytical results for zinc were all below the detection limit of 50 ug/L with the exception of the shallow groundwater at TSP-1. At this location, dissolved zinc was detected at a concentration of 50 ug/L. This concentration is well below the single background value of 103 ug/L. The extent of elevated concentrations of dissolved zinc in groundwater related to the site appears to be confined to the site area and has been defined by the existing off-site sampling locations.

The analytical results for dissolved arsenic in the shallow off-site groundwater show concentrations above median background detected at TSPs 2, 3, 4, and 18. Only TSP-18 had an arsenic concentration which exceeds the MCL established for drinking water. All four locations are located directly north of Outlot A. Approximate isoconcentration contours for dissolved arsenic in

shallow groundwater are displayed on Figure 4-14. TSP-18 located approximately 1,000 feet due north of Outlot A, is one of the closest sampling points to Outlot A. This location had the highest dissolved arsenic concentration at 54 ug/L. Dissolved arsenic concentrations approximately 600 to 700 feet north of TSP-18, at TSPs 2, 3, and 4 decrease to 36.9, 28.2, and 8.2 ug/L, respectively. Further north of TSPs 2, 3, and 4, dissolved arsenic in the shallow groundwater is below the detection limit. The extent of dissolved arsenic in the shallow groundwater has been defined by the existing data.

Dissolved arsenic concentrations in the deep groundwater range from 7.8 ug/L at TSP-19 to 88.6 ug/L at TSP-2. All arsenic concentrations, except at TSP-19, exceed the median background concentration of 7.9 ug/L. All dissolved arsenic concentrations exceed the mean plus twice the standard deviation background except at TSP-11, 14, 17, and 19. However, only TSP-2 had an arsenic concentration which exceeds the MCL established for drinking water. TSP-2 is located approximately 1,600 feet north of Outlot A. Although the distribution of dissolved arsenic in the deep groundwater, for the most part, appears to be random when compared to the shallow groundwater, the highest concentration of arsenic in deep groundwater was detected at a location due north of the site (TSP-2), similar to the distribution observed for arsenic in the shallow groundwater. This data suggests that the horizontal flow direction within the deep portion of the aquifer north of the site, continues flowing toward the north. With the exception of TSP-2, arsenic concentrations in the deep aquifer are lower than the MCL and there appears to be no apparent concentration pattern. This apparent random distribution in conjunction with the relatively low concentrations suggests that arsenic concentrations in the deep aquifer, may reflect background levels. To investigate this further, TSP arsenic data was compared to dissolved arsenic concentrations observed in the Calumet Aquifer during a study performed in the area by the United States Geological Survey (Fenelon, 1993). The data included in this report shows two USGS monitoring wells, located approximately 1 mile southeast of the site, had dissolved arsenic concentrations of 11 and 76 ug/L. These wells are reportedly located within a petrochemical land

use area. In addition, this report includes monitoring wells which are located in commercial land use areas. Dissolved arsenic concentrations in these wells range from <1 ug/L to 55 ug/L (Fenelon, 1993). Comparing TSP results with the USGS report, dissolved arsenic concentrations detected in the deep aquifer north of the site are within a range indicative of background concentrations.

Based on the off-site investigation results, the extent of elevated concentrations of dissolved zinc and fluoride have been defined with the existing data. The lateral and vertical extent of these constituents is limited. Dissolved arsenic concentrations are present in the shallow and deep groundwater above background concentrations. However, the extent of arsenic in the shallow groundwater has been defined. The extent of dissolved arsenic concentrations above the MCL in deep groundwater has been defined and appears to be limited to a small area north of the site. The dissolved arsenic concentrations detected in the deep aquifer north of the site that are less than the MCL appear to be indicative of background concentrations.

### 4.2.9 Summary of Groundwater Sampling for Release Characterization

The only VOC detected in groundwater above the MCL was TCE at MW-12S. This well is located downgradient of SWMUs #9 and #10. Both SWMUs are potential sources for these two compounds in groundwater. TCE was not detected hydraulically downgradient of MW-12S. The extent of TCE in groundwater is limited to the source area. In addition to MCL exceedances for VOCs in groundwater, several VOCs were detected in soil underlying SWMUs #1 and #2.

The only SVOCs detected in groundwater were fluoranthene, pyrene, pentachlorphenol, and bis(2-ethylhexyl)phthalate. Concentrations of fluoranthene and pyrene were detected at very low concentrations at only one monitoring well, MW-8S. This well is located hydraulically downgradient of SWMUs #1 and #2. Pentachlorphenol was detected at three on-site monitoring wells at estimated concentrations above the MCL. However, this constituent was detected in the deep background well and may be from an off-site source. There is no indication that this

constituent was ever used at the site. Bis(2ethylhexyl)phthalate was detected above the MCL in MW-6S, MW-8S, MW-11D, and MW-12D. This compound is a common plasticizer and well known sampling artifact (potential sampling sources are bailers, PVC well casing, bailer rope, etc.). Bis(2ethylhexyl)phthalate also occurred in the shallow background well and the equipment blank. In general, it appears that SVOCs are attenuated in the source areas and have not migrated in groundwater.

Arsenic and fluoride were the only inorganic constituents detected in groundwater above MCLs in the Outlot A monitoring wells. These wells are located adjacent to the northernmost property line of the site and are hydraulically downgradient of the on-site SWMUs. The source of arsenic and fluoride is most likely to be the metal processing wastes. Arsenic has a very low capacity to exchange on silicate minerals (iron hydroxides, however, are known adsorbers of arsenic) and a low to high leachability. Fluoride has a very low adsorption coefficient, high leachability, and very low capacity to exchange on minerals. The migration and transformation characteristics of these constituents, and the field results, suggest that arsenic and fluoride are not easily attenuated in the subsurface soils and may migrate in groundwater. Based on the results of the off-site groundwater investigation, the extent of elevated concentrations of fluoride has been defined. The data suggests that the lateral and vertical extent of fluoride is limited. The extent of dissolved arsenic concentrations in the shallow groundwater has been defined (Figure 4-14). The extent of dissolved arsenic concentrations above the MCL in deep groundwater has been defined and appears to be limited to a small area north of the site..

## 4.3 SURFACE WATER AND LAKE SEDIMENT

Surface water and sediment samples were collected in Lake George and the adjacent wetlands to determine if waste material at the foundry waste landfill (SWMU #1) have impacted these adjacent areas. Procedures for the sampling were detailed in the USEPA approved RFI Addendum Workplan (Geraghty & Miller, 1996). As suggested by the USEPA in correspondence

to Bridgeview Management Company, Inc. dated February 22, 1996, the sampling locations were plotted along transect lines perpendicular to the shoreline and adjacent to the Near Surface Soil Sample locations NS-43, NS-44, NS-45 and NS-46 (Figure 4-15). A total of sixteen (16) sampling locations were sampled for the four areas of concern.

Sediment samples were collected along each of the four transect lines at distances 5, 20, 40 and 80 feet from the shoreline (out into the lake or wetland area). Surface water sample collection was planned for 3 locations along each transect line, at distances of 5, 40 and 80 feet from the shoreline. Surface water sample collection required a minimum of 2 inches of water depth for sampling. For purposes of sample collection at the transect line adjacent to NS-43, the shoreline was defined as the line where the highest waves meet land. For the three transect lines located adjacent to NS-44, 45, and 46, the shoreline was defined as the location where water and land meet or where sedge is first encountered (Geraghty & Miller, 1992), whichever was closest to the respective near surface soil sampling location.

### 4.3.1 Sample Locations

The sediment and surface water sampling points were located on May 21, 1996 using the Global Positioning Satellite System (GPS) along a line determined to be perpendicular to the shoreline nearest each near surface sampling location of concern. The sampled locations are included on Figure 4-15. The shoreline position (angle) was sighted using a compass. Using the GPS, control points including the near surface soil sampling locations and the respective points at the end of each transect (100 feet from shoreline) were located and staked. This methodology should allow each sampling location to be located in the future if the stakes/flags are removed or destroyed. Prior to sampling, the three additional sampling points were located and flagged by measuring from the end control stakes and from the shoreline along a string.

### 4.3.2 Surface Water Sampling

Surface water samples were collected on June 5 and 6, 1996, prior to collecting any sediment samples. Water samples were collected prior to sediment sampling to prevent agitation of the lake bottom sediment which could introduce material into the lake water. At all locations except NS43+80, the water was too shallow for boat access, therefore chest waders were worn to approach the sample location. A total of twelve surface water sampling locations were proposed, at locations 5, 40 and 80 feet from the shoreline. However, at locations NS46+80 and NS43+5, the water depth was less than 2 inches and samples could not be collected without introducing sediment into the bailer. The water depth was less than 18 inches deep at all locations except NS-43+80, where the water was three feet deep. Two surface water samples, one near the surface and one near the lake bottom, were collected at NS43+80. Due to the shallow water at the other locations only one sample was collected.

All samples were collected using a decontaminated, 1-foot long Teflon bailer, equipped with a double check valve and dedicated rope. For shallow water samples, the bailer was submerged (where water depth allowed) to just below the lake surface. At most locations, the water depth was less than 12 inches, so the bailer was submerged horizontally. The bailer was submerged vertically at locations NS43+40 and NS43+80. At location NS43+80, where a deeper water sample was required, the bailer was also lowered approximately 6 inches from the lake bottom. An attempt was made to get closer to the lake bottom, however due to the presence of the silty organic mat, the bottom 5-inches of water contained abundant sediment.

Sample collection and equipment decontamination procedures (Section 4.1.1) were performed in accordance with the RFI Workplan. The samples were submitted for Appendix IX volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, plus fluoride and total cyanide analyses as listed on Tables 4-22, 4-23, and 4-24. Laboratory

extraction and analyses for these samples were performed in accordance with the RFI Workplan, with the exception that analysis for total metals was performed using SW 846 Method 6010A Inductively Coupled Plasma (ICP) Super Trace, as detailed in the approved RFI Addendum Workplan. This method is the same as routine ICP but has the capability to achieve the detection limits of a graphite furnace. Detection limits for metals using this method were the same as the detection limits specified in the RFI Workplan.

For quality control purposes, a duplicate sample was collected from location NS46+5 (Sample I.D. FMSWNS100+5). An equipment blank (Sample I.D. FMSWNS101) was collected by pouring laboratory supplied, reagent grade deionized water through the decontaminated bailer into the sample containers. Trip blanks were included in coolers which contained samples for VOCs analyses.

### 4.3.3 Surface Water Analytical Results

Surface water samples were analyzed for VOCs, SVOCs, metals, fluoride, and total cyanide. The laboratory analytical results, chain-of-custody documentation, and data validation summary reports are included in Appendix P. The analytical results are summarized on Tables 4-22, 4-23, and 4-24, and displayed as Figures 4-16, 4-17, and 4-18. The surface water results are discussed below.

#### 4.3.3.1 Volatile Organic Compounds

Surface water samples collected from Lake George were analyzed for VOCs by USEPA SW846 Method 8240B. The analytical results are summarized on Table 4-23. The results are also displayed on Figure 4-16. The laboratory analytical results and chain-of-custody documentation as well as the data validation summary reports are included as Appendix P.

Acetone was detected at location NS46+5 at an estimated concentration of 40 ug/L. VOC constituents were not detected in the other surface water samples or the quality control samples (trip blanks and an equipment blank).

#### 4.3.3.2 Semi-volatile Organic Compounds

The surface water samples were analyzed for SVOCs using SW846-Method 8270B. The analytical results for SVOCs in surface water are shown on Table 4-24. The SVOC concentrations that were detected or estimated are displayed on Figure 4-17. The laboratory analytical results and data validation summary reports are included as Appendix P.

Bis(2-Ethylhexyl)phthalate was detected at estimated concentrations ranging from 6.7 to 7.1 ug/L in samples collected from NS45+5, NS45+40, NS45+80, NS46+5(Duplicate) and NS46+40. In the deep surface water sample from NS43+80 bis(2-Ethylhexyl)phthalate was not detected but was estimated at a concentration of 6.7 ug/L through data validation as detailed in the data validation summary reports included in Appendix P. SVOC constituents were not detected or estimated in the other surface water samples or the equipment blank.

#### 4.3.3.3 Total Metals plus Fluoride

Surface water samples collected from Lake George were analyzed for total metals, total cyanide and fluoride. Total metals, excluding mercury were analyzed by trace Inductively Coupled Plasma (ICP) SW846 Method 6010A. Samples for total mercury were analyzed by manual cold-vapor SW846 Method 7470. Fluoride and cyanide were analyzed by EPA wet chemistry methods 340.2 and 9012, respectively. The analytical results for total metals including cyanide and fluoride are on Table 4-25. Detected concentrations of total metals, cyanide and fluoride are displayed on Figure 4-18. The laboratory analytical results, chain-of-custody documentation, and data validation summary reports are included as Appendix P.

Selenium, thallium, silver, beryllium, cobalt, chromium, nickel, antimony, tin, vanadium and cyanide were not detected in any of the surface water samples. Arsenic was not detected in either sample collected at NS43+80, but was detected at the other locations. Arsenic concentrations detected range from 5.5 ug/L at NS44+80 to 21.0 ug/L in the duplicate sample collected at NS46+5. Lead was detected in the surface water at all the locations and concentrations range from 35.0 ug/L at NS44+80 to 776 ug/L at NS46+5(Duplicate). Lead was also the only constituent detected in the equipment blank at a concentration of 3.0 ug/L. Barium concentrations were also detected in all surface water samples collected and concentrations range from 53.9 ug/L at NS44+5 to 86.5 ug/L at NS43+40. Copper and zinc were also detected in all the samples. Copper concentrations detected range from 29.3 ug/L at NS43+40 to 726 ug/L at NS46+5(Duplicate). Zinc concentrations detected range from 107 ug/L in the shallow sample at NS43+80 to 3,130 ug/L at NS46+5. Cadmium was detected in samples collected from locations NS44+5, NS44+40, NS46+5 (and Duplicate), and NS46+40 with concentrations ranging from 10.4 ug/L to 26.4 ug/L.

Cyanide was not detected in surface water samples. Fluoride was detected in all of the surface water samples at concentrations ranging from 1,800 ug/L at NS46+40 to 9,800 ug/L at NS45+5.

#### 4.3.3.4 Surface Water Analytical Results Summary

Based on the analytical results for VOCs and SVOCs, acetone and bis(2-ethylhexyl)phthalate were the only organic compounds detected in surface water adjacent to the site. Based on data validation results, acetone detected is likely a laboratory artifact. Concentrations of bis(2-Ethylhexyl)phthalate detected were at or slightly above the MCL. Also, as previously discussed, this compound is a common sampling artifact. As discussed in Section 4.2.4.2.1, this compound was detected in groundwater in both shallow and deep background

wells at estimated concentrations of 6.3 and 3.9 ug/L, respectively. These background concentrations were comparable to, and in most cases greater than, concentrations detected in the downgradient wells. This fact suggests that the source, if not a laboratory artifact, may be off-site. Organic compounds do not appear to be of concern in surface water adjacent to the site.

4.3.3.4.1 Comparison of Analytical Results for Select Metals to Indiana Water Quality Criteria and National Ambient Water Quality Criteria

Metals detected in Lake George surface water were arsenic, barium, cadmium, copper, fluoride, lead, mercury and zinc. Of these metals, Indiana has established acute and chronic surface water aquatic criteria for arsenic, cadmium, copper, mercury, and zinc. Surface water criteria for cadmium, chromium, copper and zinc are set at select water hardness values (Table 2, Appendix I). The maximum concentrations of those metals, detected in surface water collected from transects NS43 through NS46 were compared to the Indiana Water Quality Criteria (WQC) and National Ambient Water Quality Criteria (NAWQC) when state-specific criteria were not available. The mean alkalinity as $CaCO_3$ (hardness), determined for the north basin of Lake George during the lake study (R.K. Raman and others, 1996) was 130 mg/L. For the hardness dependent criteria listed on Table 2, Appendix I, hardness was conservatively rounded down to 100 mg/L $CaCO_3$.

Maximum concentrations for metals detected at all four transects, for which criteria are available, are copper (0.730 mg/L), lead (0.780 mg/L), cadmium (0.026 mg/L) and zinc (3.10 mg/L). These maximum concentrations were all detected in samples collected from transect NS46 located within the wetlands. Maximum concentrations for metals detected less frequently include arsenic (0.021 mg/L), barium (0.086 mg/L), fluoride (9.80 mg/L), and mercury (0.00038 mg/L). Acute Indiana WQC for the hardness dependent metals, including cadmium, copper, and zinc, at a hardness of 100 mg/L $CaCO_3$, are 0.0043, 0.013, and 0.12

mg/L, respectively. Chronic Indiana WQC for the same constituents, at a hardness of 100 mg/L $CaCO_3$ are 0.0022, 0.0090, and 0.12 mg/L, respectively. Lead, which is also a hardness dependent metal, does not have an Indiana WQC. Therefore, the maximum detected concentration of lead in Lake George was compared to the NAWQC. The NAWQC for lead at a hardness of 100 mg/L $CaCO_3$ is 0.082 mg/L under acute exposure conditions and 0.0032 mg/L under chronic conditions. This comparison is conservative since a hardness value of 100 mg/L was used for the comparison. All maximum concentrations for cadmium, copper, lead, and zinc in surface water exceed both acute and chronic aquatic criteria. Indiana WQC which are not hardness dependent include arsenic, (with acute and chronic values of 0.34 mg/l and 0.15 mg/L, respectively) and mercury, (with acute and chronic values of 0.0017 mg/L and 0.00091 mg/L, respectively). The Indiana WQC for arsenic and mercury were not exceeded in Lake George, however, the maximum detected concentration for mercury exceeded the chronic NAWQC.

No acute or chronic aquatic criteria is available for barium or fluoride in surface water. Since neither Indiana WQC or NAWQC were available for barium, toxicological benchmark values were taken from an ecological risk guidance document developed by the Department of Energy (Suter and Tsao 1996).

Toxicological benchmark values for barium based on Suter and Tsao (1996) are 0.11 mg/L under acute exposure conditions and 0.004 mg/L under chronic exposure conditions. The maximum detected concentration of barium exceeded the chronic aquatic benchmark value. No toxicological benchmark values could be found for fluoride. Despite exceedances of the Indiana WQC and the NAWQC, based on the U.S. Fish and Wildlife study results for Lake George (Sparks, 1995), fish in the lake have not been adversely affected and no fish consumption advisory has been issued.

### 4.3.4 Sediment Sampling

Sediment samples were collected at all 16 locations, including those in the wetland area, on June 6, 7 and 11, 1996. At each location a sample was collected from the relatively sandy soil immediately beneath the organic mat (where present). The organic mat was also sampled at all locations except NS43+20 and NS43+40, where mat material was not encountered or was too thin to sample. Efforts were made to avoid collecting visible live plant material that was present above and within the mat.

Chest waders were used to access the sample locations except at NS43+80 where deeper water required approaching the sampling location in a boat. Efforts were made to minimize disturbing the sediment in the area immediately adjacent to the sample locations. Sediment samples were collected using a hand augured soil sampler equipped with extension rods and/or a stainless steel trowel, whichever provided the most sample volume. The sampler consisted of an auger-tipped, stainless steel 2-inch inner diameter, 12-inch length core sampler. Sample collection and decontamination procedures were performed as specified in the RFI Workplan.

Following collection of each VOC sediment sample, the sample was described in the field with the following attributes recorded on soil sampling form:

- Color (using a Munsell Color Chart);
- Estimated texture (percent sand, silt and clay);
- Odor;
- Degree of saturation;

- Estimated mineral composition (for sand size and larger particles);
- Organic content; and,
- Miscellaneous attributes.

The sediment sampling forms also included general sample collection information, and are included in Appendix Q.

Each sediment sample was analyzed for VOCs, SVOCs, metals plus fluoride and total cyanide. Quality control samples were also collected and submitted in accordance with the RFI Workplan. Duplicate samples were collected from locations NS45+20 on June 7, 1996, and from NS46+20 on June 11, 1996, (Sample I.Ds. FMSEDNS103+20(0.5-1.5) and FMSEDNS104+20(0-0.5), respectively). An equipment blank (Sample I.D. FMSWNS102) was collected on June 7, 1996, by pouring reagent grade laboratory deionized water through the decontaminated stainless steel soil sampler into the sample containers. On June 11, 1996 an additional equipment blank (FMSWNS105) was collected by pouring the reagent grade lab deionized water over the decontaminated stainless steel trowel and bowl into the sample containers. Trip blanks were shipped and submitted along with water samples for VOCs analyses.

### 4.3.5 Sediment Analytical Results

Sediment samples were analyzed for VOCs, SVOCs, metals, fluoride and total cyanide. The laboratory analytical reports, chain-of-custody documentation, and data validation summary reports are included in Appendix R. The analytical results are summarized in Tables 4-26 through

4-28 and displayed on Figures 4-19 through 4-21. The analytical results of sediment sampling are described below.

#### 4.3.5.1 Volatile Organic Compounds

Sediment samples collected were analyzed for VOCs by USEPA SW846 Method 8240B. The analytical results are summarized on Table 4-26. The results are also displayed on Figure 4-19. The laboratory analytical results and chain-of-custody documentation as well as the data validation summary reports are included as Appendix R.

The analytical results indicate estimated acetone concentrations were detected in all the samples collected along transect line NS43, and also in the samples collected from NS45+20, NS45+80, NS46+5, and NS46+20. Laboratory estimated concentrations range from 10 ug/kg to 120 ug/kg. Acetone was detected at an estimated concentration of 20 ug/kg in the equipment blank collected on June 11, 1996. However, data validation results indicate that several estimated concentrations for acetone were not detected, as detailed in the data validation summary reports included in Appendix R. Toluene was detected in samples from NS43+20, NS43+80, and NS46+80 at concentrations of 10 ug/kg (estimated), 13 ug/kg, and 7.4 ug/kg, receptively. Methylene chloride was detected at an estimated concentration of 4.7 ug/kg in the surface sediment sample collected at NS43+80. The deeper sediment sample collected at NS45+5 contained an estimated concentration of 5.4 ug/kg carbon disulfide. The duplicate sample collected at NS46+20 contained an estimated concentration of 50 ug/kg 2-Butanone. Tetrachloroethene was detected in samples NS45+5, NS45+20, NS46+5, NS46+20 and NS46+40 at concentrations ranging from 5.5 ug/kg (estimated) to 26 ug/kg.

### 4.3.5.2 Semi-volatile Organic Compounds

Sediment samples collected were analyzed for SVOCs by USEPA SW846 Method 8270B. The analytical results are summarized on Table 4-27. The results are also displayed on Figure 4-20. The laboratory analytical report and chain-of-custody documentation are included as Appendix R.

Estimated concentrations of benzo(a)anthracene were detected in shallow sediment samples collected from transect lines NS44, NS45 and NS46, and also in the shallow sample from NS43+80. Benzo(a)anthracene was also detected (and estimated) in deep samples from NS43+5, NS44+20, NS46+5, NS46+20 and NS46+40. Estimated concentrations range from 38 ug/kg to 710 ug/kg.

Benzo(b)fluoranthene estimated concentrations were detected in shallow samples from transect lines NS44, NS45 and NS46, and in shallow samples collected at NS43+40 and NS43+80. Deep samples with reported detected/estimated concentrations of benzo(b)fluoranthene include NS43+5, NS44+20, NS45+5, NS46+5, NS46+20 and NS46+40. Where detected, concentrations of benzo(b)fluoranthene range from 66 ug/kg (estimated) to 1,600 ug/kg. Benzo(k)fluoranthene concentrations, where detected (and estimated) range from 96 ug/kg (estimated) to 530 ug/kg. Shallow samples with reported/estimated concentrations of benzo(k)fluoranthene were collected at NS43+80, transect line NS44, and at transect lines NS45 and NS46, excluding locations NS45+80 and NS46+80. Benzo(k)fluoranthene was reported/estimated in deep samples from NS45+5, NS45+20, NS46+5 and NS46+20. Where detected, estimated concentrations of benzo(g,h,i)perylene range from 51 ug/kg to 480 ug/kg.

Benzo(g,h,i)perylene was detected/estimated in shallow samples from transect lines NS44, NS45 and NS46, and in the shallow samples collected at NS43+40 and NS43+80. Deep

samples with reported/estimated concentrations of benzo(g,h,i)perylene include NS44+20, NS45+5, NS46+5, NS46+20, and NS46+80.

Benzo(a)pyrene was detected/estimated in the same samples at transect lines NS44, NS45 and NS46 where benzo(g,h,i)perylene was detected and was also detected in the shallow sample from NS43+80. Detected concentrations of benzo(a)pyrene range from 50 ug/kg (estimated) to 880 ug/kg.

Chrysene was detected/estimated at the same samples from transect lines NS44, NS45 and NS46 where benzo(a)pyrene was detected. Chrysene was also detected (estimated) in the deep sample at NS43+5 and the shallow samples from NS43+40 and NS43+80. Concentrations of chrysene detected/estimated range from 49 ug/kg to 770 ug/kg, both estimated.

Where detected, estimated fluoranthene concentrations range from 64 ug/kg to 1,100 ug/kg. Fluoranthene was detected/estimated in shallow samples from transect lines NS44, NS45, and NS46, and in shallow samples from NS43+40 and NS43+80. Deep samples with reported, estimated concentrations of fluoranthene include NS43+5, NS43+20, NS43+80, NS44+20, NS45+5, NS45+40, NS46+5, NS46+20, and NS46+40.

Pyrene was detected in shallow samples at transect lines NS44, NS45, and NS46 and in shallow samples from NS43+40 and NS43+80. Pyrene was also detected in deep samples from NS43+5, NS44+20, NS45+5, NS45+40, NS46+5, NS46+20, and NS46+40. Estimated pyrene concentrations detected range from 55 ug/kg to 990 ug/kg.

Where detected, estimated concentrations of indeno(1,2,3-cd)pyrene range from 58 ug/kg to 430 ug/kg. Indeno(1,2,3-cd)pyrene was detected in the shallow samples from transect lines

NS44, NS45, and NS46 and in the shallow sample collected at NS43+80. Indeno(1,2,3-cd)pyrene was also detected in deep samples collected at NS45+5, NS46+5 and NS46+20.

Phenanthrene was detected in the same shallow samples where indeno(1,2,3-cd)pyrene was detected. Deep sample locations were phenanthrene was detected include NS43+20, NS44+20, NS46+5 and NS46+20. Estimated phenanthrene concentrations detected range from 47 ug/kg to 610 ug/kg.

Bis(2-Ethylhexyl)phthalate was detected in shallow samples from NS43+5, NS44+5, NS44+40, NS45+5, NS45+20, NS45+80, and NS46+80, and in deep samples at NS43+5, NS43+20, NS44+20, NS46+5, NS46+40 and from transect line NS45. Estimated bis(2-Ethylhexyl)phthalate concentrations range from 270 ug/kg to 84,000 ug/kg. An estimated concentration of 8.2 ug/kg bis(2-Ethylhexyl)phthalate was also detected in both equipment blanks.

Dibenz(a,h)anthracene was detected in the deep sample from NS46+20 at an estimated concentration of 210 ug/kg. An estimated concentration of 350 ug/kg butyl benzyl phthalate was detected in the deep sample at NS44+20.

#### 4.3.5.3 Total Metals and Fluoride

The analytical results for total metals including cyanide and fluoride in Lake George sediment are shown on Table 4-28. Detected concentrations are displayed on Figure 4-21. The laboratory report is included in Appendix R. Analyses were performed using the same methods described for surface water analyses.

Thallium was not detected in any of the sediment samples. Arsenic, lead, barium, chromium, copper, and zinc concentrations were detected in all the sediment samples. Although

detected, many of the reported concentrations of these metals were flagged as estimated as discussed in the data validation report in Appendix R.

Arsenic concentrations detected range from 3.0 mg/kg in sample NS43+80(1-1.5) to an estimated concentration of 231 mg/kg in sample NS44+5(0-0.5). Lead was detected at concentrations ranging from 29.8 mg/kg in NS46+80(0.5-1.5) to 17,400 mg/kg (estimated) in NS45+5(0-0.5). Lead was also detected in at a concentration of 4.3 mg/kg in the equipment blank collected on June 11, 1996.

Concentrations of barium reported range from 7.0 mg/kg in NS43+80(1-1.5) to 148 mg/kg in NS45+5(0-0.5). Chromium concentrations detected range from 5.1 mg/kg in NS43+80(1-1.5) to 96.3 mg/kg in NS46+20(0-0.5). Copper was reported at concentrations that range from 13.2 mg/kg at NS43+80(1-1.5) to 11,900 mg/kg at NS46+5(0-0.5). Zinc concentrations detected range from an estimated concentrations of 23.4 mg/kg at NS43+80(1-1.5) to 49,100 mg/kg at NS45+5(0.5-1.5). Zinc was also detected in the equipment blank collected on June 7, 1996 at a concentration of 54.2 ug/kg. Selenium concentrations were not detected in the deeper samples collected at locations NS43+20, NS43+80, and NS44+80, but were estimated in the other samples at concentrations ranging from 0.54 mg/kg to 25.4 mg/kg.

Silver was detected in the surface sediment samples collected along transect lines NS44, NS45, NS46, and at NS43+5. Concentrations detected in the shallow samples range from 1.4 mg/kg to 11.7 mg/kg. Silver was also detected in the deeper sediment sample from NS45+5 at a concentration of 3.0 mg/kg. Beryllium was detected in the shallow samples along transect lines NS45 and NS46, and in shallow samples from NS43+5, NS44+5, NS44+40 and NS44+80. Beryllium concentrations detected in the shallow samples range from 0.59 mg/kg to 2.6 mg/kg. As estimated concentration of 0.57 mg/kg beryllium is reported for the deep sample from NS45+5.

Cadmium concentrations were detected in all the samples except NS43+80(1-1.5) and concentrations range from 2.1 mg/kg in the deep sample at NS45+40 to 154 mg/kg in the shallow sample from NS44+5. Cobalt was detected in shallow and deep samples collected at NS44+5, NS45+20, NS45+40 NS46+5, NS46+20, and NS46+80. Cobalt was also detected in shallow samples from locations NS43+80, NS44+40, NS44+80, and NS45+5 and in deep samples from NS43+20 and NS45+80. Concentrations of cobalt detected range from 5.1 mg/kg to 17.0 mg/kg. Nickel was detected in all the samples except for NS43+80(1-1.5), and concentrations range from 6.7 mg/kg in the deep sample from NS43+5 to 162 mg/kg in the shallow sample from NS46+5.

Antimony was detected in shallow and deep samples from NS44+5, NS44+20, NS45+5, NS46+20 and NS46+40. Antimony was also detected only in shallow samples at NS43+5, NS44+40, NS44+80, NS45+20, NS45+40, NS45+80, NS46+5 and NS46+80. Concentrations of antimony detected range from 37.0 mg/kg to 918 mg/kg. Tin was detected in shallow and deep sample from locations NS44+5, NS44+20, NS45+5, NS45+20, NS46+5, NS46+20, and NS46+40. Tin was detected only in the shallow samples from NS43+5, NS44+40, NS44+80, NS45+40, NS45+80 and NS46+80. Where detected, tin concentrations range from 130 mg/kg to 3,910 mg/kg.

Vanadium was detected in all the samples except NS43+80(1-1.5), and concentrations range from 5.7 mg/kg in the duplicate from NS45+20(0.5-1.5) to 86.2 mg/kg in the duplicate sample from NS46+20(0-0.5). Mercury was detected in shallow and deep samples collected from locations NS43+5, NS44+5, NS44+20, NS45+5, NS46+5, NS46+20, and NS46+40. Mercury was also detected in the shallow samples from NS43+80, NS44+40, NS44+80, NS45+20, NS45+40, NS45+80, NS46+80 and in the only sample collected from NS43+20. Mercury concentrations detected range from 0.10 mg/kg to 8.8 mg/kg.

Cyanide was detected in the shallow samples from NS46+5, NS46+20 and NS46+80 at estimated concentrations of 0.64 mg/kg, 0.6 mg/kg and 3 mg/kg, respectively. Fluoride was detected in all the sediment samples collected. Estimated fluoride concentrations range from 36 mg/kg at NS43+20 to 1,700 mg/kg in the shallow sample from NS46+5.

#### 4.3.5.4 Comparison of Metals Analytical Results to Background Sediments

Tables 4-29 and 4-30 contain background concentrations for stream and/or lake sediments for Indiana and Illinois (R.K. Raman et. al, 1996). Table 4-29 lists maximum background concentrations of pollutants in Indiana stream and lake sediments, and Table 4-30 lists concentration ranges of constituents in Illinois lake sediments which are classified as below normal, normal, elevated and highly elevated. The analytical results for detected metals in Lake George sediment were compared to the Indiana maximum background concentrations and the Illinois maximum normal classification concentration. Those constituents which meet or exceed the Indiana maximum background concentrations are shown in bold on Table 4-31, and those constituents that are above the Illinois maximum normal concentration are underlined on Table 4-31. No maximum background concentrations or classification ranges for sediment were given for barium, tin, or vanadium. In addition, no Illinois classification ranges were given for selenium, silver, beryllium, cobalt, nickel, antimony or cyanide.

Arsenic detected in the shallow sediment samples at transect lines NS44, NS45 and NS46 exceed the Indiana maximum background concentration (MBC) of 29 mg/kg and the Illinois normal maximum concentration (NMC) of <27 mg/kg. The arsenic concentrations detected in deep samples from NS44+5, NS44+20, and NS45+5 also exceed the Indiana MBC and the Illinois NMC.

Lead concentrations detected in sediment exceeded both the Indiana MBC of 150 mg/kg and Illinois NMC of 100 mg/kg in all the samples except in deep samples from NS43+80,

NS44+80 and NS46+80. The Indiana MBC of 0.55 mg/kg selenium is exceeded where selenium was detected except in the deep samples at NS43+5 and NS45+80 and in the sample collected from NS43+40.

Where silver was detected, concentrations exceed the Indiana MBC of <0.05. The practical laboratory quantitation limit of <1.0 silver is above the MBC. The Indiana MBC for beryllium of 0.7 mg/kg is exceeded where beryllium was detected, except in the shallow sample from NS44+40 and the deep sample at NS45+5. Where cadmium was detected concentrations exceed both the Indiana MBC of 1.0 mg/kg and the Illinois NMC of <1.8 mg/kg. Cobalt concentrations detected in sediment did not exceed the Indiana MBC of 20 mg/kg.

Chromium concentrations detected in shallow samples at transect lines NS45 and NS46, and in shallow samples collected from NS44+5 and NS44+80 exceed the Indiana MBC of 50 mg/kg and the Illinois NMC of 30 mg/kg. The Illinois NMC for chromium is also exceeded by the chromium concentrations detected in shallow samples collected at NS43+5, NS44+20, and NS44+40. Copper concentrations detected, except at NS43+80(1-1.5), exceed the Indiana MBC of 13.2 mg/kg. Where the MBC is exceeded for copper , the Illinois NMC of <100 mg/kg is also exceeded, except at NS46+80(0.5-1.5).

The Indiana MBC of 21 mg/kg nickel is exceeded by concentrations detected in the shallow samples from transect lines NS44, NS45 and NS46, and in the shallow sample collected at NS43+5. Nickel concentrations detected in deep samples from NS45+5, NS46+20, and NS46+40 also exceed the Indiana MBC. Where antimony was detected, concentrations exceed the Indiana MBC of 0.49 mg/kg. The laboratory practical quantitation limit of 30 mg/kg antimony is greater than the Indiana MBC.

The Indiana MBC of 130 mg/kg and the Illinois NMC of 175 mg/kg for zinc are exceeded where zinc was detected, except in the deep samples from NS43+80 and NS46+80. Mercury concentrations detected in shallow samples collected at NS43+5, NS43+80, and along transect lines NS44, NS45, and NS46 exceed the Illinois NMC of <0.25 mg/kg and the Indiana MBC of 0.44 mg/kg for mercury. Deep sample mercury concentrations at NS45+5 and NS46+40 also exceed the NMC and MBC. Estimated total cyanide concentrations exceed the Indiana MBC of <0.1.

## 4.4 AIR

Contaminants identified at the site, which potentially could be released into the atmosphere, would be the fine-grained particulate wastes identified at SWMUs #1 and #8. Descriptions of these waste types are detailed in Section 3.0 and summarized below.

Three fine-grained waste types were identified at SWMU #1. A common characteristic of these wastes types is that they consist of fine particulates or are capable of being easily reduced to fine particles. These waste types were visually described as gray slag and bluish gray powdery slag (WG-23,24,25), light gray powder which had an appearance similar to baghouse dust (WG-32,33,34), and dark gray and black, powdery, sandy, granular slag (WG-35,36,37). These samples were analyzed for total metals and the results are summarized in Table 3-2. All three samples contained relatively high levels of metals with the highest concentrations of lead and cadmium detected in the bluish gray powdery slag and light gray powder. For the most part, the particulate material at SWMU #1 is indurated and wind dispersion of undisturbed material is unlikely, nor has it been observed in the field. However, wind dispersion of any mechanically disturbed fine-grained waste types at SWMU #1 is possible. Provision for isolation of these fine-grained waste types from wind exposure would effectuate their containment in terms of the air pathway.

The waste type(s) identified at SWMU #8, the main baghouse, were described as fine, light-colored dusts which may be a type of fume. Waste samples from SWMU #8 were submitted for total metals analysis. The results, summarized in Table 3-4, show the waste material contains high levels of metals, particularly cadmium and lead. The fine-grained nature of this waste material suggests that dispersion to the atmosphere is possible. However, the waste is located within the confines of the main baghouse and is therefore protected from wind dispersion.

## 4.5 SUBSURFACE GAS

A total of 234 subsurface gas sampling locations were located within SWMUs #1 and #2. Locations of these sampling points, designated SG-1 through SG-234, are included on Figure 3-3. Details of the subsurface gas investigation are included in Section 3.6.1. Samples of soil gas were collected at each sampling point and analyzed in the field for target VOCs which included BTEX, TCE, 1,1,1 TCA, PCE, 1,1 DCA, 1,1 DCE, c-1,2 DCE. The analytical results are included as Table 3-1 and the laboratory analytical results and data validation summary report are included in Appendix F.

Those samples with detectable concentrations of the target VOCs include SG-43, 126, 209, 211, 215, 216, 217, 218, 231, and 232. The analytical results and locations for these ten (10) sampling locations are included on Figure 3-3. Benzene and toluene were detected at SG-43 at concentrations of 0.1 and 0.2 ug/L, respectively. Sample location SG-126 had a PCE concentration of 0.04 ug/L. SG-209 had concentrations of TCE at 0.03 ug/L and PCE at 0.02 ug/L. SG-211, 215, 217, 218, 231, and 232 all had concentrations of 1,1,1 TCA reported at 0.04, 0.02, 0.02, 0.07, 0.01, and 0.02 ug/L, respectively. The sample for SG-216 had a concentration of c-1,2 DCE of 0.17 ug/L. The remaining samples had no detectable concentrations of the target compounds.

The occurrence of soil gas survey detections were infrequent (8 of 234 sites) and at exceedingly low concentrations, especially for the chlorinated solvents. In general, three areas

located within SWMUs #1 and/or #2 were identified where target VOCs were detected. One area is located in the south central portion of SWMU #1 adjacent to the wetlands. A second area is located at SWMUs #1 and #2, along and adjacent to the west fence line of the manufacturing parcel, and a third area is located at SWMU #2 in the southeastern portion of the manufacturing parcel adjacent to the fence line.

Following the subsurface gas investigation, near surface soil samples were collected from the three identified areas where VOCs were detected in soil gas. Soil samples were analyzed for VOCs (Figure 4-3). None of the target VOCs were detected in soil samples collected from the three areas except for toluene, detected at NS37, 40, 41, 42, and 43 at estimated concentrations ranging from 3.0 to 8.7 ug/kg, and TCE and PCE at NS45 (30 and 37 ug/kg, respectively). NS37 is located at SWMU #2 at the southeast corner of the manufacturing facility. NS40, 41, and 42 are also located at SWMU #2 adjacent to the west fence line of the manufacturing parcel. NS43 is located on the western portion of SWMU #1 adjacent to Lake George, and NS45 is located in the south central portion of SWMU #1, adjacent to the wetland area. VOC concentrations detected in soil at all locations are relatively low and based on the soil gas results, limited to relatively small, isolated areas.

No VOCs (with the exception of acetone detected at MW-7D) were detected in groundwater at monitoring wells located immediately downgradient of SWMUs #1 and #2 (Figure 4-6).

In addition to VOC analyses for near surface soil and groundwater samples, lake surface water and sediment samples were collected and analyzed for VOCs. No target VOCs were detected in surface water collected adjacent to SWMU #1. Two target VOCs, toluene and PCE, were detected in lake sediment samples (Figure 4-19). Toluene was detected at three randomly distributed sediment sampling locations and at relatively low concentrations (7.4 to 13 ug/L). PCE

was detected at several sediment sampling locations along transects NS45 and NS46. Both transects are located in the wetland adjacent to the area where PCE and TCE were detected during the soil gas investigation and near surface soil sampling. Highest PCE concentrations were detected immediately adjacent to the shoreline along Transect NS45 at concentrations of 24 and 26 ug/L.

### 4.5.1 Subsurface Gas Summary

The soil gas investigation results suggest that the occurrence of VOCs in the subsurface at SWMUs #1 and #2 is isolated, and where detected, VOCs occur at relatively low concentrations. No target VOCs were detected in groundwater or surface water adjacent to SWMUs #1 and #2. Target VOCs were detected in both soil and sediment samples in an isolated, relatively small area in the south central portion of SWMU #1 and adjacent wetland.

# 5.0 POTENTIAL RECEPTORS IDENTIFICATION

Geraghty & Miller performed a reference and file document review to identify potential human populations and environmental systems in the site area which may be susceptible to contaminant exposure from the facility.

## 5.1 BACKGROUND

The site is located in an industrial and residential area of Hammond, Indiana adjacent to the northeast shoreline of Lake George. The city limit of Whiting, Indiana is located just north and immediately east of the site. Regionally, the site area contains several former and existing oil refining and storage operations, steel mills, and former foundry operations. In addition, attendant industries such as industrial gases, specialty chemicals, and firebrick producers are present. Documented environmental impacts in the area include petroleum, metals, and waste accumulations.

There are four identified Comprehensive Response Compensation and Liability Information System (CERCLIS) sites that have been ranked for inclusion on the National Priorities List which are located immediately adjacent to or within 1,000 feet of Lake George. Locations of these facilities are shown on Figure 1-1. The nearest of these facilities to the site are the former Amoco research facility and the H. Bairstow Company site. The former Amoco research facility is located south and adjacent to the site. The Bairstow site is an inactive slag landfill located southwest of the site, adjacent to the southern shoreline of Lake George. Approximately 1 mile south-southwest of the site is the Union Carbide Whiting Plant off-site landfill (Whiting landfill). Approximately 1 mile south of the site is the Amoco Oil Company J&L disposal site. Based on documented environmental assessments performed at these four CERCLIS sites; groundwater, the Site, and Lake George are potential receptors to environmental

contaminants identified at these facilities (G&M, 1992). Contaminants identified at these sites include volatile and semi-volatile organic compounds and metals.

## 5.2 GROUNDWATER USE

Based on the groundwater analytical results collected at on-site monitoring wells and off-site TSPs, groundwater is identified as a receptor to constituents identified at the site. However, the results of the off-site investigation suggest that the higher concentrations of metals, specifically arsenic, zinc, and fluoride, are for the most part contained to the site. Groundwater from the Calumet Aquifer in the area of the site is not used as a potable water supply. This aquifer is not a major source of water supply in northern Lake County because the municipalities of Hammond, Whiting, East Chicago, and Gary all obtain their water from Lake Michigan. Several regional water quality investigations of the shallow groundwater system in the area surrounding the site have been conducted by the U.S. Geological Survey (USGS) (Watson and Fenelon, 1988; Banaszak and Fenelon, 1988; Fenelon, 1993). The results of these investigations suggest that water quality within the Calumet Aquifer is variable and has locally been affected by commercial and industrial development.

### 5.2.1 Water Well Records Search

On October 30, 1996, Geraghty & Miller conducted a review of the water well files located at the IDNR Division of Water. Both field verified and non-field verified water wells, located within a 1-mile radius of the site, were included in the review. In addition, the file for all registered groundwater high-capacity withdrawal facilities (greater than 70 gallons per minute (gpm)), located within a 2-mile radius of the site, were reviewed. Approximate locations of water supply wells and high capacity withdrawal facilities are shown on Figure 5-1. The well logs for wells with capacities less than 70 gpm, and data sheets for high-capacity withdrawal facilities, are included in Appendix S.

Several water wells (rated less than 70 gpm), located within a 1-mile radius of the site, were identified in the file search. Of these wells, three are listed as monitoring/observation wells. One well is listed as a recovery well owned by Amoco Oil Company. Locations of these wells are not included on Figure 5-1. Only four wells identified within the search area have water well records which indicate the wells were completed for water supply. Two of these wells were reportedly drilled in 1933 at the former Whiting Ice & Coal Co. The company is no longer in business and the property, now owned by the City of Whiting, has been converted to a green space and parking lot. Based on Geraghty & Miller communication with the City of Whiting, these two wells no longer exist. In addition, a water well, located adjacent to Lake Michigan at Wihala Beach and approximately 4,000 feet northeast of the site, is owned by the Lake County Parks and Recreation Department. This well is completed at a depth of 26 feet in the Calumet Aquifer and was reportedly installed as a water supply for the restroom facilities at the beach. Geraghty & Miller contacted Mr. Dave Kwolek, Operations Department, Lake County Parks and Recreation Department, on October 31, 1996, to inquire on the status of the well. Mr. Kwolek reported that the well is no longer in use and that all water used at the facility is currently supplied by city water. The approximate location of this well is shown on Figure 5-1. A well owned by Amoco Oil Company, located at the refinery facility in Whiting, is completed in bedrock at a depth of 1,238 feet. The approximate location of this well is included on Figure 5-1. The current status of this well is unknown.

The only active high capacity groundwater withdrawal facilities, located within a 2-mile radius of the site, are owned by Amoco Oil Company. Amoco reportedly operates approximately 50 wells, all screened within the Calumet aquifer, at depths ranging from 6 to 28 feet. These wells are utilized for groundwater recovery/remediation and are located between 1/2 to 1-3/4 miles from the site, to the northeast, east, southeast, and south. Locations of these wells are included on Figure 5-1.

Based on current limited groundwater use by local government and industry in the area, the variable water quality of the aquifer, and the abundant supply of surface water already in use from Lake Michigan, future use of groundwater from the Calumet Aquifer would likely be limited to non-potable use.

## 5.3 SURFACE WATER

The major surface water features in the site area include Lake George, located adjacent to and south of the site, Wolf Lake, located approximately 3,000 feet west of the site, and Lake Michigan, located approximately 3,500 feet northeast of the site. In order to evaluate the local and possible future uses of surface water draining from the facility, the surface-water drainage pattern of the site was evaluated from site topography (G&M, 1992). As discussed in Section 2.4.1, based on the drainage patterns identified from the topographic map, Lake George is identified as the only potential receptor of surface water flow from the site.

The Illinois State Water Survey performed a diagnostic feasibility study of Lake George from July 1992 through November 1993. The objective of this study was to assess the present condition of the lake and recommend an integrated protection/mitigation plan for the lake and associated watershed (R.K. Raman and others, 1996). Based on the water quality results of this study, characteristics for which standards are available in Indiana, were within acceptable limits, with the exception of pH in areas of the south basin. The pH exceedances in the south basin were attributed to runoff and leachate from the Bairstow site (Figure 1-1). The study concluded that the major problems associated with the lake are the deteriorated condition of the outlet structure (located along Calumet Avenue at the southwest corner of the lake), the profusion of aquatic macrophytes, the shallow depth, and the white precipitate in the south basin associated with the Bairstow site.

Lake George has been identified as a potential receptor to on-site surface water drainage. In addition, the current extent of the waste material in SWMU #1 encroaches into Lake George at the site. The analytical results of foundry wastes indicate that there is the potential that metals could be leached from these wastes. Evaluation of surface water runoff patterns indicates, at least at present, that surface water runoff and precipitation that would come into contact with the wastes and then runoff would flow to Lake George or the marshy area adjacent to Lake George and south of the site.

Based on the available data, the constituents detected at SWMUs #1 and #2 have impacted the adjacent lake sediments and/or surface water. There do not appear to be any transport mechanisms for other on-site SWMUs to have impact these media. The potential for facilities other than Federated Metals to have impacted the Lake George sediment and surface water is apparent based upon locations of off-site sources and record reviews. Based upon the site data, it appears that the highest concentrations of metals in the sediments and surface water occur in the wetlands immediately adjacent to SWMU #1.

### 5.3.1 Surface Water Use

With the exception of one bedrock groundwater supply well at the Amoco Refinery (status unknown), surface water withdrawal accounts for all registered withdrawals in the area of the site. Surface water use includes both municipal and industrial supply. Registered surface water withdrawal facilities were identified during the Geraghty & Miller file search at IDNR. There are seven high capacity surface water withdrawal facilities located within the 2-mile search radius. Locations of these facilities are shown on Figure 5-1. Amoco Oil Company operates four of these withdrawal facilities. Two are located in Lake Michigan approximately 1-1/4 mile northeast of the site and the other two are located approximately 2 miles south of the site at and adjacent to the Lake George Canal. American Maize Products operates two surface withdrawal

facilities northwest of the site. One facility is located on the northern end of Wolf Lake approximately 1 1/2 mile from the site, and another facility is located approximately 2 miles from the site in Lake Michigan. In addition, Lever Brothers operates a surface water withdrawal facility approximately 2 miles northwest of the site in Lake Michigan. The municipalities of Hammond and Whiting both obtain their water from Lake Michigan. Whiting water is supplied by the Amoco registered withdrawal facility, located approximately 1 1/4 mile east-northeast of the site (Figure 5-1) and Hammond's surface water intake is located off the map approximately 2 miles north of the site.

There are no surface water withdrawal facilities located on or adjacent to Lake George. Lake George, by comparison to other lakes in the area, is relatively small at 148 acres. Lake George, except from localized runoff, does not receive surface water flow under most conditions (R.T. Kay and others, 1996). In addition, the lake is shallow with average depths of only 1.8 and 2.2 feet for the north and south basins, respectively (R.K. Raman and others, 1996). Based on the limited volume of available surface water in Lake George, future surface water use for municipal and/or industrial supply from this source would be unlikely. Therefore, potential future use of surface water from Lake George would likely be limited to domestic, non-potable use (i.e. lawn watering, etc.). During past site activities, Geraghty & Miller has not observed anyone using the lake water for such a purpose.

## 5.4 HUMAN USE AND ACCESS

Access to the manufacturing parcel is limited through the entrance gates located along Indianapolis Boulevard. The remaining manufacturing parcel is enclosed by a fence. There are no access restrictions to Outlot A, located north of the manufacturing parcel. However, no SWMUs or exposure pathways are identified at Outlot A. Access to the landfill is restricted by an 8-foot tall chain-link or corrugated metal fence. In addition, dawn to dusk, year round security is provided to keep potential trespassers off the landfill.

There are no public access restrictions to Lake George and there is no mechanism currently available for tracking the number and type of users. Because the potential user population is likely to be from surrounding communities, Table 5-2 provides pertinent population and economic census data for Calumet City, Illinois and East Chicago, Hammond, and Whiting, Indiana (R.K. Raman and others, 1996). The potential user population, economic base, user demands/needs, etc. cannot be determined since the lake is situated within the most highly industrialized region of the midwest. No available information indicates that any specific segments of the user population have been adversely affected by the lake's degradation (R.K. Raman and others, 1996).

Lake George is not used as a potable water supply. Additionally, recreational use of Lake George, is limited due to the shallow depth of the lake. The lake is not conducive to swimming and there is a city beach at nearby Wolf Lake. Therefore, the pathways to humans are wading and fish consumption. No consumption advisories have been issued for fish from Lake George following study by IDEM and USFWS (Sparks, 1995).

## 5.5 BIOTIC RECEPTORS

The description of the biotic resources near the site include lake and wetland plants, terrestrial fauna, and fish (G&M, 1992). The lake and wetland plants would potentially most likely be affected by changes in water quality of the lake and by sediment transfer to the lake and wetlands (G&M, 1992). Data collected from the Diagnostic-Feasibility Study of Lake George (R.K. Raman and others, 1996) and the RFI Task I report (G&M, 1992) are presented below.

### 5.5.1 Lake George Biological Characteristics

Based on qualitative observations during the field investigations performed by Geraghty & Miller and total phosphorus concentrations determined within 100 feet of the slag area in Lake George in 1992, it appears that Lake George resembles a eutrophic system (G&M, 1992). The results of the lake study also indicate that the lake is eutrophic (R.K Raman and others, 1996). In general, a eutrophic lake is characterized by shallow basin slopes, abundant plant nutrients (especially nitrogen and phosphorus) and aquatic macrophytes, limited water transparency, nuisance algal blooms, and oxygen depletion in the summer hypolimnion. Eutrophication is a normal process whereby a body of water traps a portion of the nutrients originating in the surrounding drainage basin. As a lake ages, the degree of enrichment from nutrient materials increase.

An approximately one-acre eutrophic pond was identified adjacent to the southernmost shallow emergent marsh near Calumet College (G&M, 1992). This community type has the same general characteristics as the eutrophic lake community, but is distinguished because ponds are usually smaller and typically do not stratify during the summer months. Although, no limnological data were collected, an abundance of aquatic macrophytes and colonial algae were observed along the extensive littoral region and the water appeared to be relatively murky. This abundance of littoral growth exceeded the amount observed in Lake George.

The lake study included sampling of plankton (algae and zooplankton) during the period April through October 1993 (R.K. Raman and others, 1996). Sampling results of this study identified 33 different algal species in the north basin of Lake George and 32 species in the south basin, for a total of 44 species of algae. The most frequently occurring algae identified during this study included several species of green algae, a flagellate algae, and a desmid algae. The prevalent algae species identified at Lake George were also the most frequently occurring algae

in central Illinois' Lake Bloomington and Lake Evergreen. Based on the densities of algae and algal types identified, excessive algal growths in the lake do not seem to be a problem (R.K. Raman and others, 1996).

Zooplankton (excluding protozoans) densities were also measured in the lake study. Total observed zooplankton densities ranged from 100 to 1,400 counts per liter (cts/L) in the north basin to undetectable to 2,100 cts/L in the south basin. In both north and south basins, 11 zooplankton species were identified. The dominant species were found to be either copepoda or cladocera (R.K. Raman and others, 1996).

A macrophyte (aquatic vegetation) survey was performed as part of the lake study in July 1993 (R.K. Raman and others, 1996). Six different types of macrophytes were identified during the study; six species in the north basin and five species in the south basin. The most common species include Eurasian water milfoil (Myriophyllum spicatrum), chara, and naiad (Najas flexilis). These three macrophytes are also commonly found in Wisconsin Lakes (R.K. Raman and others, 1996). Approximately 85 to 90 percent of Lake George is reportedly covered by macrophytes. In general, the excessive growth of aquatic vegetation is attributed to the overall shallow depth and low turbidity of the lake water.

Benthic macroinvertebrates, animals within the aquatic system visible to the unaided eye and capable of being retained by a U.S. Standard No. 30 mesh sieve, were also included in the Lake George study (R.K. Raman and others, 1996). Macroinvertebrates are sensitive to changes in the aquatic environment. The benthic macroinvertebrates communities were sampled in May and August 1993. The benthos community was dominated by relatively pollution-intolerant members of the Chironomidae (64%), tolerant members of Chironomous (14%), and aquatic worms (7%). The study found that the benthos community in the lake is more diverse and pollution sensitive than that found in most stratified lakes.

### 5.5.2 Lake George Fauna

According to the lake study, the most recent fish management study for the lake was performed by the IDNR in 1980 (R.K. Raman and others, 1996). Fifteen species of fish were collected during this survey. Game species included largemouth bass, bluegill, yellow perch, black crappie, northern pike, and channel catfish. A previous IDNR survey, conducted in 1977, was performed following a fairly severe winter kill. The 1980 survey concluded that the sport fishing value of the lake had improved substantially since the 1977 survey.

Two fish studies were conducted for Lake George, one performed by the Indiana Department of Environmental Management (IDEM) in 1988 (Carnow, Conibear & Associates, 1991), and the U.S. Fish & Wildlife Service in 1992 (Sparks, 1995). The results of these studies did not result in any fish consumption advisories for the lake. The concentrations of constituents detected in fish tissue were below FDA guidelines for human consumption. The general criteria for the protection of wildlife are the Indiana chronic aquatic criteria (CAC) and the chronic Federal Water Quality Criteria. The maximum concentrations reported in the north basin of Lake George for antimony, copper, fluoride, iron, lead, mercury, silver, and zinc exceeded the maximum concentration for potential adverse affects. However, there is no indication that these constituents are in a form that is available for uptake or that these have been sequestered in whole fish tissue at concentrations suggestive of high risk to the fish (Sparks, 1995).

## 5.6 TERRESTRIAL HABITATS AND RECEPTORS

Geraghty & Miller identified fifteen ecological communities in the site area during field investigations performed in 1992 (G&M, 1992). Many of these communities were created or have been influenced by urban development and/or site related activities. A description of each community, as previously described in the RFI Task 1 report follows.

*Residential/Industrial Community*

This community accounted for approximately 60 percent of the study area and was characterized by houses and large buildings, with paved roads and parking lots. Associated with many of the homes were mowed lawns interspersed with shade trees. Some of the more common shade trees included silver maple (*Acer saccharinum*), white ash (*Fraxinus americana*), elm (*Ulmus* spp.), tuliptree (*Liriodendron tulipifera*), red maple (*Acer rubrum*), and locust (Leguminosae). Shrubs (mainly evergreens) were observed surrounding many of the homes.

*Mowed/Maintained Community*

Mowed grasses occasionally interspersed with planted trees (similar to the shade trees observed in the residential/industrial community) characterized the majority of this community. This community was located immediately north of the facility in a narrow strip and in a few areas adjacent to Calumet College. Lack of buildings and pavement was the main contrast between this and the residential/industrial community. Three small (<0.5 acres) seasonally flooded wetlands were observed in a portion of this community north of the facility and will be discussed later.

While the majority of this community was apparently maintained by adjacent residents, a narrow band (approximately 5-feet wide) of vegetation following the Lake George shoreline appears unmanaged. Willow (mainly pussy willow, *Salix discolor*), staghorn sumac (*Rhus typhina*), box elder (*Acer negundo*), and eastern cottonwood (*Populus deltoides*) were common shrubs/saplings, while field horsetail (*Equisetum arvense*), common plantain (*Plantago major*), cocklebur (*Xanthium chinense*), common evening primrose (*Oenothera biennis*) and common mullein (*Verbascum thapsus*) interspersed among various unidentified grasses were common

herbaceous species. Grape (*Vitis* spp.) was commonly intertwined on the woody vegetation. Because it was such a narrow band, it was not separated into a distinct community.

*Slag Landfill*

Slag deposition was the dominant feature of this community, which was located immediately west and south of the manufacturing parcel at the site. In most places, slag deposition occurred up to the Lake George shoreline. On the slag south of the manufacturing area, the vegetation growing on the predominantly black fill material was limited to an occasional eastern cottonwood sapling. Most of the slag west of the manufacturing area was characterized by more-abundant growth of eastern cottonwood saplings and slender rush (*Juncus tenuis*). Pussy willow, various grasses, common mullein, evening lychnis (*Lychnis alba*) and grape vines were less abundant. Some of the grasses and slender rush appeared to be stressed as evidenced by the brown coloration and wilted appearance. The reason(s) for this stress were not investigated but could have been related to temperature, precipitation, available nutrients, and other factors. During the May 15, 1992 investigation, a thin band (1 to 2 feet) of hydrophytic vegetation, mainly giant reed grass (*Phragmites australis*), was common between the toe of slag landfill slope and the Lake George shoreline; however, during the June 16, 1992 visit, this band of vegetation widened to approximately 5 to 10 feet, presumably due to lake drawdown. The hydrophytic species identified during the later visit (in addition to giant reed grass) included hardstem bulrush (*Scirpus acutus*), three-square bulrush (*Scirpus americanus*), sedges (*Carex* spp.), goldenrod (*Solidago* spp.), Lady's-thumb (*Polygonum periscaria*), cut-leaved water-horehound (*Lycopus americanus*), spikerush (*Eleocharis* spp.) and purple loosestrife (*Lythrum salicaria*).

*Successional Old Field*

This community type is defined as an area that has been previously disturbed and subsequently grown over with herbaceous vegetation as the dominant cover type. The amount of woody vegetation does not exceed approximately 50 percent. This community is relatively short lived, rapidly succeeding to a shrubland, woodland or forest community. Characteristic vegetation includes those herbaceous species able to rapidly colonize disturbed areas and initially out compete other vegetation.

A community matching this description was observed in several relatively small areas south of the facility. In general, these areas were similar in vegetative species composition with common strawberry (*Fragaria virginiana*), various unidentified grasses, common mullein and yarrow (*Achillea millefolium*) most abundant. Field horsetail, bedstraw (*Galium* sp.) common plantain and common evening primrose were also observed, especially near New York Avenue.

*Shrubby Successional*

This community type is similar to the successional old field community except that it has greater than approximately 50 percent cover by shrubs. An area matching this description was observed along the abandoned Indiana Harbor Railroad having a relatively steep slope and located between the facility and the mowed/maintained community having seasonally flooded basins. The most abundant shrubs observed were pussy willow and staghorn sumac. Eastern cottonwood saplings were also frequently observed. Grape vines, field horsetail and common mullein were common in the herbaceous strata. Additionally, garlic (*Allium* sp.), tulips (*Tulipa* sp.) and wild lily-of-the-valley (*Maianthemum canadense*) were present and, according to a nearby resident, planted in this community by local residents.

*Successional Forest*

This community is typified by a predominance (>50 percent canopy cover) of trees occurring on a previously disturbed area. The trees are generally shade intolerant and well adapted to establishment after disturbance. The understory is relatively sparse and usually consists of vegetation characteristic of a successional old field or of remnants of the community existing prior to disturbance.

The successional forest community was located west of Calumet College with a narrow strip continuing down to the causeway and along a built-up slope immediately north of the College. Eastern cottonwood was the most abundant tree species observed with white mulberry (*Morus alba*) less frequent. No other tree species were observed. The understory was relatively sparse with amur honeysuckle (*Lonicera maackii*) the most-abundant shrub. Various unidentified grasses, common strawberry (*Fragaria virginiana*), and goldenrod (*Solidago* spp.) comprised the majority of the herbaceous layer. Virginia creeper (*Parthenocissus quinquefolia*) was an abundant vine in this community.

*Seasonally Flooded Basin Community*

As previously discussed, three small (<0.5 acres) seasonally flooded wetland areas were observed in the mowed/maintained community north of the facility. These topographically lower areas were characterized by an abundance of spikerush (*Eleocharis* spp.) and rushes (*Juncus* spp.). Soils were mottled with a 3/2 (on a 2.5 YR Munsell Soil Chart) matrix in several dry soil cores in this region. Based on these observed characteristics, these soils would be considered hydric (Environmental Laboratory, 1987). Additionally, a nearby resident related that much of this area may become flooded during storm events, but is sufficiently dry for mowing during the drier summer months.

*Sedge Meadow Community*

This community type is characterized by permanently saturated and seasonally flooded soils with the predominant vegetation composed of species in the sedge family (*Carex*, *Scirpus*, *Eleocharis*, *Cyperus*, etc). Grasses and other herbaceous species may be found to a lesser extent. Typically, this community occurs in lake basins, along streams, or on the upslope edge of shallow emergent marshes.

Several sedge meadow communities were observed adjacent to the slag deposition south of the facility. The western-most portion of this community was composed of three-square bulrush and spikerush. During the period between the two field investigations, this area had expanded due to the lake drawdown. Proceeding eastward, the community was composed almost exclusively of three-square bulrush. This area was topographically higher than the westernmost portion and the bulrush was generally brown and appeared to have reduced growth relative to other areas.

*Shallow Emergent Marsh Community*

This community type typically has soils that are saturated to inundation, although standing water does not exceed approximately 6 inches throughout most of the growing season. The water level usually drops in late summer exposing underlying soils. Herbaceous emergent vegetation such as cattail (*Typha* spp.), bulrushes, and sedges, is the dominant cover type.

A shallow emergent marsh community was identified in several regions south of the facility. In all locations, common cattail (*Typha latifolia*) and narrow-leaved cattail (*Typha angustifolia*) were the most abundant species observed. Other species occasionally observed

included giant reed grass (*Phragmites australis*), purple loosestrife (*Lythrum salicaria*), spikerush and sedges (*Carex* spp.). During the field investigation, much of this community was dry enough to walk on.

*Artificially Created Wetland*

This community type may display some or all of the characteristics of a wetland community (predominance of hydrophytic vegetation, hydric soils and wetland hydrology) because of past activities such as filling, grading, or dredging. However, if the activity occurred relatively recently, the vegetation or soils necessary to meet the criteria may not have developed.

A small island in Lake George apparently created by the placement of fill material was observed immediately south of the slag piles. The substrate was comprised of gravel and broken cement blocks with no soil development observed. A narrow line of rocks connected this island to the slag piles. Giant reed grass, a hydrophytic species known to colonize disturbed areas, covered the majority of the island. It is possible that the relatively recent placement of fill or wave action may have precluded the development of hydric soils.

*Low Prairie Community*

This open community type is characterized by herbaceous vegetation such as grasses and forbs. The underlying soil is saturated although standing water is usually only present during floods and snowmelt.

An area resembling a low prairie community was located immediately south of the facility adjacent to New York Avenue. Common strawberry, goldenrod, various grasses and field horsetail were the most commonly observed species. A predominance of at least facultative

wetland indicators was suggested by this community (Reed, 1988). This predominance could indicate wetland conditions.

Because of the vegetative composition, several shallow (approximately thirty inch) soil cores with a hand auger were taken in the low prairie community to characterize soil conditions which would clarify wetland status. Black organic-rich soil was observed in the top approximately 10 inches and was underlain by brighter-colored sands. Vertical brown streaks were occasionally observed in the sandy layer. These observations are characteristic of sandy hydric soils (Environmental Laboratory, 1987) and, in combination with the vegetative composition, are indicative of a wetland.

*Shrub Swamp Community*

This ecological community type is characterized by a predominance of deciduous shrubs growing on saturated to seasonally flooded soils. It is commonly found along lake shores, in wet depressions not associated with a body of water, or as a transition zone bordering other wetland communities. Several shrub swamp communities were identified during the field investigation and were usually associated with the shallow emergent marsh community.

The southernmost shrub community was characterized by an abundance of willow (mainly pussy willow), with red-osier dogwood and currant (*Ribes* sp.) observed to a lesser extent. The herbaceous strata included mainly sedges, three-square bulrush, and giant reed grass. Eastern cottonwood and black willow trees were observed along the causeway sideslopes in this community and the shallow emergent marsh. A shrub swamp community immediately north of Calumet College was similar in vegetative species composition, although the shrub strata was composed almost exclusively of pussy willow.

The shrub swamp communities located east of the eastern terminus of the slag deposition (northeast of the small shrub wetland proximal to Calumet College) were characterized by an abundance of either pussy willow or sandbar willow (*Salix exigua*) in the shrub strata. The herbaceous strata was more diverse than the other shrub swamp communities. Examination of the soils in the two easternmost communities revealed similar conditions detailed for the low prairie community, while the shrub swamp community immediately east of the slag had black organic-rich soil to a depth of approximately 30 inches.

*Hardwood Swamp*

This community type is dominated by deciduous hardwood trees. Similar to the shrub swamp and low prairie communities, underlying soil is saturated for much of the growing season with standing water common during high-water periods.

A hardwood swamp community was located immediately south of the facility approximately 300 feet west of New York Avenue. The canopy cover in this community was less dense than the previously mentioned forested community; however, eastern cottonwood was again the most abundant tree species. Black willow was less common. The understory was more dense than the other forested community, possibly due to the reduced canopy cover, with amur honeysuckle and red-osier dogwood (*Cornus stolonifera*) common. Willow shrubs were occasionally interspersed in this community. Field horsetail, goldenrod and various unidentified grasses were common in the herbaceous strata. Grape and virginia creeper were common vines, growing on much of the woody vegetation and the ground.

Portions of this forested region were topographically higher than the shrubby wetland on either side. This increased elevation may be due to the placement of fill. However, this

placement appeared to have taken place several years ago as the topographically higher areas were densely vegetated. The lower areas of this community were characterized by soils similar to those described for the low prairie community.

### 5.6.1 Terrestrial Fauna

Animals located within the site area were observed and recorded along with the ecological community(ies) in which they were observed (Geraghty & Miller, 1992). However, because the investigation was completed during only one day of the year (May 15, 1992), during daylight hours, the numbers and types of animals observed are most likely an under-estimation of actual numbers utilizing the study area.

The majority of the fauna observed were birds, many of which were found in a variety of ecological communities (Table 5-1). The remaining animals observed, an eastern cottontail (*Sylvilagus floridanus*) and a muskrat (*Ondatra zibethica*), were mammals. Because of their transient behavior, ecological communities, other than those the organisms were observed in, are also presented in Table 5-1. This summary shows that many of the ecological communities identified in the study area are likely to provide habitat for wildlife. Because the ecological investigation performed by Geraghty & Miller for the Task I report likely under-estimated the amount of fauna utilizing the site area, a brief discussion of animal groups not observed but expected to occur in the identified communities is included. This discussion is based on a review of habitat preferences for various groups of organisms.

Due to the variety of ecological communities, a diversity of birds would be expected to utilize the site area. Ducks, grebes, herons, egrets and shorebirds (sandpipers, plovers, etc.) would likely make use of the water bodies, adjacent marshes, and recently exposed shorelines. Various species of hawks may use forested edges near the open field and low prairie communities for foraging and resting. Owls and woodpeckers would likely use the forested

areas, while warblers, sparrows, and vireos would be expected in the old field/low prairie, shrubby and forested communities.

Numerous other animals would also be expected to utilize many of the communities. Mammals such as shrews, moles, voles and mice would likely use the successional old field, low prairie and the forested regions, while squirrels and foxes may also utilize the forested area. Due to the amount of open water and wetland communities observed, several reptiles and amphibians would likely be found. Included in this group would be salamanders, turtles, snakes, frogs, and toads.

The IDNR and United States Fish & Wildlife Service (USFWS) were requested to search their databases for the documented occurrences of endangered, threatened, and rare (ETR) species or unique communities within a 1-mile radius of the facility (Geraghty & Miller, 1992). The purpose of these searches is to identify any known ETR species or significant communities on or near the facility that may potentially be impacted by site activities or future remedial plans.

The IDNR's response to the request included a listing of ETR species known to occur, either historically or currently, within a 2-mile radius of the facility. Of the thirty-nine species listed by the state, nineteen were observed prior to 1950 and only five (all birds) were observed in Section 7 (the facility's location). These birds are typically associated with open water and marshy areas. The IDNR also stated that the peregrine falcon (*Falco peregrinus*) has been nesting for the fourth consecutive year (1992 data) within 2-miles southeast of the site. None of these species were observed during the field investigations.

The most-current edition of *Indiana's Rare Plants and Animals; A Checklist of Endangered and Threatened Species* was reviewed to determine if plants and/or animals identified during the field investigations but not listed in the above database searches were

recognized as having special status by the state. No organisms identified during the investigations were on the state list.

The USFWS concluded that the federally endangered Indiana bat (*Myotis sodalis*), peregrine falcon (*Falco peregrinus*) and bald eagle (*Haliaeetus leucocephalus*) have ranges that overlap the facility. However, based on the lack of suitable habitat for the Indiana bat and bald eagle in the vicinity of the facility, adverse impacts to them are not expected. Also, although one of two pairs of peregrine falcons nesting in Northern Lake County probably forage near the facility, it is unlikely potential remedial plans will adversely impact them. There is no indication now that any endangered, threatened, or rare species are being impacted by the facility.

# 6.0 PROTECTION STANDARDS

Task V of the Work Plan for RCRA Facility Investigation for this Site requires analysis and summary of all facility investigations and results. The Work Plan states that the objective of this task is:

> . . .to ensure that the investigation data are sufficient in quality (e.g., quality assurance procedures have been followed) and quantity to describe the nature and extent of contamination, potential threat to human health and the environment, and to support the Corrective Measures Study (Consent Decree, Exhibit B, p. 19 [1992]).

The preceding sections of this RFI Report have provided analysis of all facility investigation data and a discussion of the type and extent of contamination at the facility including sources and migration pathways, as required by Task V.

Task V also requires a discussion of groundwater protection standards (GWPS) and other relevant protection standards most appropriate for the Site. This Section 6.0 of the RFI Report provides that discussion. The purpose of this discussion is to provide the information necessary for development of the Corrective Measures Study (CMS). As set forth below, additional analysis in the context of the CMS is necessary for selection of the most appropriate standards of protection for the Site.

## 6.1 GROUNDWATER PROTECTION STANDARDS

The appropriate GWPS is ordinarily set by the facility RCRA permit (40 CFR 264.92). However, the Site for which this RFI was performed does not have a RCRA permit. In this case,

GWPS must be established as part of the CMS. For purposes of investigation results analysis, the Safe Drinking Water Act MCLs and, when available, background concentrations were used as standards of comparison for analytical purposes. In USEPA guidance for proposed Corrective Action Regulations, USEPA stated that cleanup levels are best established as part of the remedy selection process, that is, in the context of the CMS (see 55 FR 145, p. 30804 [July 27, 1990] for additional discussion on the CMS. In recent USEPA guidance, USEPA explained that: "Although EPA has finalized only a few sections of the 1990 proposal [for corrective action regulations], the bulk of the proposal is routinely used as guidance during corrective actions" [61 FR 85, p. 19434 (May 1, 1996)]). Setting of GWPS requires an understanding of the characteristics of groundwater at the Site and of affected groundwater off-site as well as of the regulatory requirements.

Section 4.2 of this RFI Report provides a detailed discussion of groundwater characterization. In summary, the investigation showed that water saturated conditions are encountered near the contact between the overlying surficial fill material and the native sediments. Generally, groundwater flows toward the north to northeast at the Site under an approximate hydraulic gradient of 0.0025 and a calculated average linear velocity of 1.9 foot/day. Off-site, groundwater continues flowing to the north toward Lake Michigan; however, area sewers may affect local groundwater flow.

The following analytes were not detected in groundwater: chlorinated herbicides, pesticides/PCBs, organophosphorus compounds, dioxins/furans, and total cyanide. These data and historical data, which show that these compounds were never used at the facility, support the position that any future groundwater sampling should omit analysis for these parameters.

VOCs detected in on-site groundwater were: acetone, trichloroethene, and 1,2-dichloroethene (total). Acetone is a common laboratory artifact and was detected in an

equipment blank, method blanks, and a trip blank. Acetone was detected in one groundwater sample at a concentration of 60 ug/L. There is no MCL established for acetone and at the concentrations detected, levels are well below the milligram/Liter concentrations known to be toxic to aquatic organisms. TCE and 1,2-DCE (total) were detected only at MW-12S. The concentration for TCE at this location exceeded the MCL. MW-12S is located downgradient of SWMUs #9 and #10. Both SWMUs are potential sources for these two compounds in groundwater.

The only SVOCs detected in groundwater above MCLs were pentachlorophenol and bis-2(ethylhexl)phthalate. Pentachlorophenol was detected at MW-6D and MW-8D at estimated concentrations of 4.1 and 3.4 ug/L. The highest concentration for this compound was found in the deep background well. Based on this data, the groundwater flow direction, as well as soil sampling analytical results (this compound was not detected in any soil samples at the site), it appears that an off-site source may exist. Bis-2(ethylhexyl)phthalate was detected in groundwater at low and estimated concentrations. The MCL for this compound is 6 ug/L. The maximum concentration detected in groundwater was 13 ug/L, approximately twice the MCL. Bis-2(ethylhexyl)phthalate is a common plasticizer and sampling artifact and at the low concentrations detected in an aquifer not used for potable water, it does not appear to be of concern.

Total cadmium, chromium, arsenic, and mercury were detected in groundwater in concentrations above MCLs, and total lead was detected in concentrations above the treatment-based standard (see Section 4.2.4.3.1). Dissolved metals showed exceedances of MCLs or treatment-based standards for cadmium, arsenic, and mercury. With the exception of arsenic and mercury, which form multi-atom ions of high solubility relative to their respective MCL, the results of unfiltered versus filtered samples are clearly different for metals in groundwater. Groundwater containing sediment in conjunction with field preservation techniques for unfiltered

samples would be expected to have higher concentrations of metals than the unfiltered samples. Therefore, any comparison for total versus dissolved metals is difficult. In addition, comparing total metals results to drinking water standards (MCLs), which technically apply at the tap, becomes an issue since turbidity levels in the monitoring wells at the site are generally above the physical primary standard for turbidity (one monthly average turbidity unit) for a drinking water supply. Fluoride concentrations in all monitoring wells except MW-6S and MW-12S exceed the MCL for this ion. While the fluoride standard was exceeded, the samples were unfiltered and fluoride is not a carcinogen. Specific waste types as sources for the arsenic, mercury, and fluoride detected in the groundwater are not clear. However, the waste materials at the site are the probable sources.

When low-flow purging and sampling techniques were used at monitoring wells, MW-10S/MW-10D, MW-11S/MW-11D, and the Outlot A monitoring wells, for total metals and fluoride, and at MW-12S and MW-15S for VOCs, the results showed fewer exceedances of MCLs than did previous data. MCLs for lead, cadmium, and zinc were only exceeded at MW-11S. The MCL for mercury was only exceeded at MW-11D. Both of these wells are located at the manufacturing parcel. The wells downgradient of MW-11S/MW-11D, which include both clusters MW-16S/MW-16D and MW-17S/MW-17D, are located on Outlot A. Arsenic and fluoride concentrations detected in the deep downgradient wells (MW-16D and MW-17D) and fluoride only in shallow well MW-16S, exceeded the MCLs. No other metals analyzed exceeded MCLs in the wells downgradient of the site.

Low-flow purging and sampling methodology was approved by U.S. EPA as an addendum to the workplan. Future performance monitoring of groundwater at the site for inorganics should be performed using the low-flow sampling methodology.

Off-site groundwater samples were collected at TSPs located north and northeast of the site. Samples were analyzed for dissolved arsenic, dissolved zinc, and fluoride. Where detected, concentrations of fluoride in off-site groundwater ranged from 200 to 840 ug/L. These concentrations were below the MCL of 4,000 ug/L for fluoride in drinking water. The extent of elevated fluoride concentrations detected in on-site groundwater have been defined by the data. The TSP analytical results for zinc were all below the single background value of 103 ug/L. Based on the off-site investigation results, the extent of elevated concentrations of dissolved zinc and fluoride have been defined by the data.

Dissolved arsenic concentrations are present in off-site shallow and deep groundwater above background concentrations. Dissolved arsenic was detected above the MCL at two locations (TSP-2 and TSP-18) both located due north of the site. The extent of dissolved arsenic concentrations in both the shallow groundwater (Figure 4-14) and deep groundwater has been defined and appears to be limited to a small area north of the Site. The extent of dissolved arsenic concentrations above the MCL in deep groundwater has been defined and appears to be limited to a small area north of the site. The dissolved arsenic concentrations detected in the deep aquifer north of the site, that are less than the MCL appear to be indicative of background concentrations. Regional analytical data for the area support this finding (Fenelon, 1993).

### 6.1.1 Background Levels

EPA's goal in regard to groundwater is: "to return usable groundwaters to their maximum beneficial uses wherever practicable, within a time frame that is reasonable given the particular circumstances of the site" (61 FR 85, p. 19448 [May 1, 1996]). EPA recognizes that in some instances, restoration is impracticable, and in that case, the goal of corrective action should be: "to prevent or minimize further migration of the plume, prevent exposure to the contaminated groundwater and evaluate further risk reduction." Source control is also a necessary requirement.

Where available, data from this RFI were compared to background; however, due to the predominantly industrial use of the land area surrounding the Site, in many instances determination of background levels in groundwater is impracticable (see 55 FR 145, p. 30815 [July 27, 1990] for a discussion on determination of background levels). Similarly, remediation to background levels may not be required. Problems associated with establishing background levels in groundwater in the site area have been demonstrated.

### 6.1.2 Safe Drinking Water Standards

Data collected from the investigation were routinely compared to Maximum Contaminant Levels (MCLs) and Secondary MCLs (SMCLs), which are standards technically applicable at the tap for drinking water purposes. On-site sampling using low-flow sampling techniques more closely approximated turbidity levels suitable for drinking water comparisons and resulted in exceedances of MCLs or SMCLs only for lead (15 ug/L), cadmium (5 ug/L), zinc (5 mg/L), arsenic (50 ug/L), and fluoride (4 mg/L) in on-site wells (The MCL or SMCL is provided in parentheses). Downgradient sampling (at the property boundary) indicated MCL exceedances of fluoride and arsenic. Off-site sampling defined the extent of the fluoride and arsenic concentrations in exceedance of MCL levels. Future monitoring of groundwater at the site and at any off-site wells for inorganics should be performed using the low-flow sampling methodology.

Due to reasons described in Section 5.2 of this report, MCLs may not be an appropriate cleanup standard for corrective action. USEPA recognizes that in situations where groundwater is not currently used or where groundwater may be unsuitable for future use as a future drinking water, cleanup to MCLs might not be required (55 FR 145, p. 30817 [July 27, 1990]). It is highly unlikely that the aquifer would ever be used for drinking water in the future due to the same reasons it is not currently used for that purpose: the abundant supply of surface water

already in use from Lake Michigan, the variable water quality of the aquifer due to industrial land use of major portions of the area overlying the aquifer, SMCL exceedances, municipal restrictions, and the limited saturated thickness of the aquifer.

## 6.2 OTHER PROTECTION STANDARDS

### 6.2.1 Soil

EPA guidance provides that future use of the Site is determinative of the appropriate cleanup standard for soil:

> Contaminated soil would be remediated to levels consistent with plausible future patterns of use. . . .At industrial sites or sites dedicated to long-term hazardous waste management, cleanup to [levels] less stringent [than residential standards] might be appropriate, although institutional controls could be necessary to ensure that the use pattern did not change (55 FR 145, p. 30804 [July 27, 1990]).

The most recent EPA guidance provides that corrective action should be results oriented, risk-based, and apply multiple corrective measures as most appropriate to the specific site (61 FR 85, p. 19441 [May 1, 1996]).

### 6.2.2 Surface Water

Data indicate that while elevated levels of metals were present in Lake George, the lake still supports a healthy aquatic community. After detailed study of the lake, the Department of U.S. Fish & Wildlife determined it to be unnecessary to issue an advisory against human consumption of fish caught in the lake (Sparks, 1995).

> EPA guidance states that:
>
> Releases to surface water should be remediated to levels consistent with potential uses. . . .In the case of surface water, environmental effects are likely to be particularly important, because levels protective for humans may often be insufficient for protection of aquatic organisms (55 FR 145, p. 30804 [July 27, 1990]).

Lake George is used for recreational purposes of fishing and wading, but it is too shallow for swimming. The lake is not used as a drinking water source.

Although several exceedances of the state and federal ambient water-quality criteria for metals were noted in surface-water samples, fish studies did not indicate adverse effects to fish. Both the USFWS study (Sparks, 1995) and the IDEM study (Carnow, Conibear & Assoc., 1991) concluded that fish tissue concentrations in the lake are below FDA guidelines for human consumption.

### 6.2.3 Sediments

No VOCs or SVOCs background criteria were available for comparison for lake sediment sampling analytical results. The analytical results for inorganic compounds detected in lake sediment were compared to background concentrations for stream and/or lake sediments for Indiana and Illinois. Constituents exceeding background in sediment samples were arsenic, lead, selenium, silver, beryllium, cadmium, chromium, copper, nickel, antimony, zinc, mercury, and cyanide. Location of the exceedances in relation to SWMU #1 indicate that a release from the waste slag landfill has occurred.

### 6.2.4 Air

EPA guidance states that:

> Like soil, air releases from solid waste management units would be of concern where they posed a threat to humans or the environment under plausible current or future use patterns. Typically, corrective action involving air concerns would involve source control to minimize further releases (55 FR 145, p. 30805 [July 27, 1990]).

The only potential releases to air occur as a result of wind-blown dust. There are no ongoing steady sources to air.

## 7.0 REFERENCES

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# APPENDIX A

## MONITORING WELL/PIEZOMETER CONSTRUCTION LOGS

## APPENDIX B

## CONE PENETRATION TEST (CPT)/ELECTRICAL CONDUCTIVITY (EC) LOGS

# APPENDIX C

## HYDRAULIC CONDUCTIVITY RAW TEST DATA AND CALCULATIONS

# APPENDIX D

## SOIL BORING LOGS

# APPENDIX E

## GEOTECHNICAL LABORATORY ANALYTICAL REPORT

# APPENDIX F

## SOIL GAS SAMPLING LABORATORY ANALYTICAL RESULTS AND DATA VALIDATION SUMMARY REPORT

# APPENDIX G

## WASTE SAMPLE CHARACTERIZATION LABORATORY ANALYTICAL RESULTS AND DATA VALIDATION SUMMARY REPORTS

# APPENDIX H

## NEAR SURFACE SOIL SAMPLING LABORATORY ANALYTICAL RESULTS AND DATA VALIDATION SUMMARY REPORTS

# APPENDIX I

## INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT (IDEM) SUMMARY OF TIER II CLEANUP GOALS AND INDIANA ACUTE AND CHRONIC AQUATIC CRITERIA

# APPENDIX J

## NEAR SURFACE SOIL SAMPLING BORING LOGS

# APPENDIX K

## MONITORING WELLS/PIEZOMETERS/TSP ELEVATION SURVEY DATA

# APPENDIX L

## GROUNDWATER SAMPLING LOGS

# APPENDIX M

## GROUNDWATER LABORATORY ANALYTICAL RESULTS AND DATA VALIDATION SUMMARY REPORTS

# APPENDIX N

## LOW FLOW GROUNDWATER LABORATORY ANALYTICAL RESULTS AND DATA VALIDATION SUMMARY REPORTS

# APPENDIX O

## OFF-SITE GROUNDWATER ANALYTICAL REPORTS

# APPENDIX P

## SURFACE WATER LABORATORY ANALYTICAL RESULTS AND DATA VALIDATION SUMMARY REPORTS

# APPENDIX Q

## SEDIMENT SAMPLING LOGS

# APPENDIX R

## LAKE SEDIMENT LABORATORY ANALYTICAL RESULTS AND DATA VALIDATION SUMMARY REPORTS

# APPENDIX S

## IDNR WATER WELL/SURFACE WATER RECORDS

**Table 2-1. Groundwater Elevations, Data Collected on 7/17/95, Federated Metals, Hammond, Indiana.**

| Location | Ground Elevation | Top of Casing Elevation | Total Depth | Depth to Water | Groundwater Elevation |
|---|---|---|---|---|---|
| MW-6S | 585.23 | 588.05 | 18.68 | 6.06 | 581.99 |
| MW-6D | 585.23 | 588.24 | 32.46 | 6.29 | 581.95 |
| MW-7S | 584.64 | 588.19 | 15.56 | 7.58 | 580.61 |
| MW-7D | 584.64 | 587.50 | 31.35 | 6.89 | 580.61 |
| MW-8S | 584.31 | 587.57 | 14.95 | 6.34 | 581.23 |
| MW-8D | 584.31 | 587.59 | 32.75 | 6.37 | 581.22 |
| MW-9S | 583.27 | 586.89 | 14.88 | 6.37 | 580.52 |
| MW-9D | 583.27 | 586.29 | 32.28 | 5.77 | 580.52 |
| MW-10S | 584.18 | 587.39 | 15.17 | 7.46 | 579.93 |
| MW-10D | 584.18 | 586.54 | 31.44 | 6.62 | 579.92 |
| MW-11S | 582.77 | 586.49 | 15.00 | 6.37 | 580.12 |
| MW-11D | 582.77 | 585.80 | 31.39 | 5.66 | 580.14 |
| MW-12S | 583.00 | 586.69 | 15.00 | 6.53 | 580.16 |
| MW-12D | 583.00 | 586.17 | 31.40 | 6.01 | 580.16 |
| MW-13S | 583.01 | 587.24 | 14.93 | 6.77 | 580.47 |
| MW-13D | 583.01 | 585.76 | 31.29 | 5.29 | 580.47 |
| P-1S | 582.96 | 586.42 | 8.30 | 6.70 | 579.72* |
| P-1D | 582.96 | 585.96 | 28.70 | 6.27 | 579.69* |
| MW-1 | NR | 586.26 | NM | NM | NM |
| MW-2A | 583.59 | 585.50 | 21.03 | 4.19 | 581.31 |
| MW-3 | 583.36 | 583.63 | 16.48 | 3.12 | 580.51 |
| T-3 | 582.49 | 583.67 | 25.89 | 3.62 | 580.05 |
| T-4 | NR | 586.58 | 30.92 | 6.11 | 580.47 |

All measurements recorded in feet.
Wells surveyed by Geraghty & Miller, Inc. on 7/17/95.
Total depths and depths to water measured from top of casings.
* Piezometers had not been developed by 7/17/95.

**Table 2-2. Groundwater Elevations, Data Collected on 9/5 and 9/6/95, Federated Metals, Hammond, Indiana.**

| Location | Ground Elevation | Top of Casing Elevation | Total Depth | Depth to Water | Groundwater Elevation |
|---|---|---|---|---|---|
| MW-6S | 585.23 | 588.05 | 18.52 | 6.85 | 581.20 |
| MW-6D | 585.23 | 588.24 | 32.14 | 7.07 | 581.17 |
| MW-7S | 584.64 | 588.19 | 15.48 | 8.14 | 580.05 |
| MW-7D | 584.64 | 587.50 | 30.90 | 7.42 | 580.08 |
| MW-8S | 584.31 | 587.57 | 15.06 | 6.99 | 580.58 |
| MW-8D | 584.31 | 587.59 | 31.18 | 7.05 | 580.54 |
| MW-9S | 583.27 | 586.89 | 14.66 | 6.94 | 579.95 |
| MW-9D | 583.27 | 586.29 | 31.43 | 6.33 | 579.96 |
| MW-10S | 584.18 | 587.39 | NM | 7.94 | 579.45 |
| MW-10D | 584.18 | 586.54 | NM | 7.10 | 579.44 |
| MW-11S | 582.77 | 586.49 | NM | 6.83 | 579.66 |
| MW-11D | 582.77 | 585.80 | NM | 6.13 | 579.67 |
| MW-12S | 583.00 | 586.69 | NM | 6.93 | 579.76 |
| MW-12D | 583.00 | 586.17 | NM | 6.41 | 579.76 |
| MW-13S | 583.01 | 587.24 | NM | 7.29 | 579.95 |
| MW-13D | 583.01 | 585.76 | NM | 5.80 | 579.96 |
| P-1S | 582.96 | 586.42 | NM | 7.04 | 579.38* |
| P-1D | 582.96 | 585.96 | 28.69 | 6.69 | 579.27* |

All measurements recorded in feet.
Wells surveyed by Geraghty & Miller, Inc. on 7/17/95.
Total depths and depths to water measured from top of casings.
NM - Not Measured

**Table 2-3. Groundwater Elevations, Data Collected on 10/2/95, Federated Metals, Hammond, Indiana.**

| Location | Ground Elevation | Top of Casing Elevation | Total Depth | Depth to Water | Groundwater Elevation |
|---|---|---|---|---|---|
| MW-6S | 585.23 | 588.05 | 18.45 | 7.48 | 580.57 |
| MW-6D | 585.23 | 588.24 | 31.96 | 7.68 | 580.56 |
| MW-7S | 584.64 | 588.19 | 15.45 | 8.43 | 579.76 |
| MW-7D | 584.64 | 587.50 | 30.80 | 7.75 | 579.75 |
| MW-8S | 584.31 | 587.57 | 15.00 | 7.38 | 580.19 |
| MW-8D | 584.31 | 587.59 | 31.49 | 7.42 | 580.17 |
| MW-9S | 583.27 | 586.89 | 14.60 | 7.18 | 579.71 |
| MW-9D | 583.27 | 586.29 | 31.02 | 6.58 | 579.71 |
| MW-10S | 584.18 | 587.39 | NM | 8.18 | 579.21 |
| MW-10D | 584.18 | 586.54 | NM | 7.34 | 579.20 |
| MW-11S | 582.77 | 586.49 | NM | 7.10 | 579.39 |
| MW-11D | 582.77 | 585.80 | NM | 6.40 | 579.40 |
| MW-12S | 583.00 | 586.69 | NM | 7.15 | 579.54 |
| MW-12D | 583.00 | 586.17 | NM | 6.65 | 579.52 |
| MW-13S | 583.01 | 587.24 | NM | 7.53 | 579.71 |
| MW-13D | 583.01 | 585.76 | NM | 6.05 | 579.71 |
| P-1S | 582.96 | 586.42 | NM | 7.21 | 579.21* |
| P-1D | 582.96 | 585.96 | NM | 6.83 | 579.13* |
| MW-1 | NR | 586.26 | NM | NM | NM |
| MW-2A | 583.59 | 585.50 | NM | NM | NM |
| MW-3 | 583.36 | 583.63 | NM | NM | NM |
| T-3 | 582.49 | 583.67 | NM | NM | NM |
| T-4 | NR | 586.58 | NM | NM | NM |

All measurements recorded in feet.
Wells surveyed by Geraghty & Miller, Inc. on 7/17/95
Total depths and depths to water measured from top of casings.
NM - Not Measured

**Table 2-4. Groundwater Elevation Data, Data Collected June 10, 1996, Federated Metals, Hammond, Indiana.**

| Location | Ground Elevation | Top of Casing Elevation | Total Well Depth | Total Depth on 6/10/96 | Total Depth of Fill in Well | Depth to Water #1 | Depth to Water #2 | Average Depth to Water* | Average Ground-water Elevation |
|---|---|---|---|---|---|---|---|---|---|
| MW-6S | 585.05 | 587.57 | 18.68 | 18.22 | 0.46 | 5.41 | 5.41 | 5.41 | 582.16 |
| MW-6D | 585.09 | 587.76 | 32.46 | 31.55 | 0.91 | 5.60 | 5.60 | 5.60 | 582.16 |
| MW-7S | 584.10 | 587.80 | 15.56 | 15.52 | 0.04 | 5.69 | 5.69 | 5.69 | 582.11 |
| MW-7D | 584.19 | 587.04 | 31.35 | 30.64 | 0.71 | 4.94 | 4.94 | 4.94 | 582.10 |
| MW-8S | 583.66 | 587.21 | 14.95 | 14.95 | 0.00 | 4.81 | 4.81 | 4.81 | 582.40 |
| MW-8D | 584.10 | 587.22 | 32.75 | 30.96 | 1.79 | 4.84 | 4.84 | 4.84 | 582.38 |
| MW-9S | 582.83 | 586.55 | 14.88 | 14.60 | 0.28 | 4.71 | 4.71 | 4.71 | 581.84 |
| MW-9D | 582.93 | 585.88 | 32.28 | 30.45 | 1.83 | 4.08 | 4.08 | 4.08 | 581.80 |
| MW-10S | 583.88 | 586.98 | 15.17 | 14.93 | 0.24 | 5.45 | 5.45 | 5.45 | 581.53 |
| MW-10D | 583.47 | 586.13 | 31.44 | 30.55 | 0.89 | 4.63 | 4.63 | 4.63 | 581.50 |
| MW-11S | 582.39 | 586.11 | 15.00 | 14.83 | 0.17 | 4.65 | 4.65 | 4.65 | 581.46 |
| MW-11D | 582.48 | 585.39 | 31.39 | 29.87 | 1.52 | 3.94 | 3.94 | 3.94 | 581.45 |
| MW-12S | 582.59 | 586.26 | 15.00 | 14.95 | 0.05 | 5.09 | 5.09 | 5.09 | 581.17 |
| MW-12D | 582.58 | 585.74 | 31.40 | 30.63 | 0.77 | 4.57 | 4.57 | 4.57 | 581.17 |
| MW-13S | 582.58 | 586.83 | 14.93 | 14.93 | 0.00 | 5.46 | 5.46 | 5.46 | 581.37 |
| MW-13D | 582.61 | 585.34 | 31.29 | 30.59 | 0.70 | 3.99 | 3.99 | 3.99 | 581.35 |
| MW-14S | 582.50 | 582.10 | 10.55 | 10.42 | 0.13 | 1.00 | 1.00 | 1.00 | 581.10 |
| MW-14D | 582.48 | 581.85 | 27.40 | 27.35 | 0.05 | 0.77 | 0.77 | 0.77 | 581.08 |
| MW-15S | 581.84 | 586.10 | 15.29 | 15.29 | 0.00 | 5.36 | 5.36 | 5.36 | 580.74 |
| MW-16S | 582.32 | 586.67 | 15.36 | 15.30 | 0.06 | 6.24 | 6.24 | 6.24 | 580.43 |
| MW-16D | 582.18 | 585.58 | 30.00 | 29.99 | 0.01 | 5.14 | 5.14 | 5.14 | 580.44 |
| MW-17S | 582.16 | 586.34 | 15.32 | 15.32 | 0.00 | 5.99 | 5.99 | 5.99 | 580.35 |
| MW-17D | 582.12 | 585.03 | 28.90 | 28.90 | 0.00 | 4.68 | 4.68 | 4.68 | 580.35 |
| P-1S | 582.51 | 585.97 | 9.46 | NM | NM | 4.95 | 4.95 | 4.95 | 581.02 |
| P-1D | 582.51 | 585.51 | 29.00 | NM | NM | 4.55 | 4.55 | 4.55 | 580.96 |

NOTES:
Ground and Top of Casing Elevations for MW-6S/6D through MW-14S/14D resurveyed by Plumb Tuckett & Assoc. on 1/8/96.
Ground and Top of Casing Elevations for MW-15S, MW-16S/16D, and MW-17S/17D surveyed by Plumb Tuckett & Assoc. on 5/21/96.
* Average depth to water is the sum of Depths to Water #1 and #2 divided by 2.

Table 2-5. Hydraulic Conductivity Test Results, Federated Metals, Hammond, Indiana.

| Location | Test Type | K (ft/min) | y0 (ft) | Average K (ft/min) | Average K (ft/day) | Average K (ft./day), Shallow Aquifer | Average K (ft/day), Deep Aquifer | Average Linear Velocity, Shallow Aquifer | Average Linear Velocity, Deep Aquifer |
|---|---|---|---|---|---|---|---|---|---|
| MW-7S | Slug in | 0.1574 | 1.425 | 0.1574 | 227 | 227 | | 1.89 | |
| MW-7D | Slug in | 0.1256 | 2.642 | 0.1256 | 181 | | 181 | | 1.51 |
| MW-13S | Slug in | 0.4398 | 3.039 | 0.4398 | 633 | 633 | | 5.28 | |
| MW-13D | Slug in | 0.1425 | 2.881 | 0.1425 | 205 | | 205 | | 1.71 |
| MW-15S | Slug in | 0.1923 | 2.445 | 0.1876 | 270 | 270 | | 2.25 | |
| MW-15S | Slug out | 0.1832 | 1.41 | | | | | | |
| MW-16S | Slug in | 0.2527 | 1.018 | 0.2438 | 351 | 351 | | 2.93 | |
| MW-16S | Slug out | 0.2348 | 1.772 | | | | | | |
| MW-16D | Slug in | 0.05703 | 1.371 | 0.06612 | 95 | | 95 | | 0.79 |
| MW-16D | Slug out | 0.07521 | 2.731 | | | | | | |
| MW-17S | Slug in | 0.2552 | 1.18 | 0.2635 | 379 | 379 | | 3.16 | |
| MW-17S | Slug out | 0.2717 | 2.466 | | | | | | |
| MW-17D | Slug in | 0.1002 | 2.254 | 0.08851 | 127 | | 127 | | 1.06 |
| MW-17D | Slug out | 0.07681 | 1.468 | | | | | | |
| **Average Values:** | | **0.1832** | **2.007** | **0.1905** | **274** | **372** | **152** | **2.59** | **1.26** |

All hydraulic conductivity (K) values were estimated from slug test data.
Estimates of average linear velocity were calculated using a hydraulic gradient (I) of 0.0025 and a porosity of 0.30.

## Table 2-6. Water Quality Characteristics of Lake George, North Basin
## Data Collected October 1992 to September 1993, R.K. Raman et al., 1996

| *Parameters* | *10/15* | *11/10* | *12/22* | *1/20* | *2/11* | *3/17* | *4/14* | *5/10* | *5/27* | *6/10* | *6/22* | *7/6* | *7/20* | *8/3* | *8/18* | *9/18* | *9/28* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Secchi reading, inches | 16 | 17 | 21 | 28 | 28 | 27 | 26 | 12 | 23 | 18 | 12 | 12 | 12 | 29 | 28 | 30 | 32 |
| pH | 8.17 | 8.30 | 8.03 | 7.90 | 7.68 | 8.25 | 8.24 | 8.38 | 8.30 | 8.46 | 8.83 | 8.54 | 8.46 | 8.60 | 8.54 | 8.97 | 8.40 |
| Alkalinity, mg/L as $CaCO_3$ | 142 | 161 | 182 | 168 | 147 | 145 | 137 | 147 | 153 | 111 | 103 | 81 | 113 | 115 | 114 | 96 | 97 |
| Conductivity, mg/L | 1,070 | 980 | 1,040 | 960 | 810 | 760 | 690 | 730 | 730 | 600 | 570 | 540 | 590 | 640 | 600 | 500 | 480 |
| Chloride, mg/L | 125 | 101 | 100 | 94 | 69 | 65 | 58 | 60 | 79 | 51 | 47 | 45 | 49 | 56 | 54 | 43 | 42 |
| Solids, mg/L | | | | | | | | | | | | | | | | | |
| Total suspended | 18 | 55 | 5 | 2 | 3 | 6 | 14 | 14 | 30 | 15 | 12 | 11 | 3 | 1 | 2 | <1 | 1 |
| Volatile suspended | 14 | 28 | 5 | 2 | 3 | 5 | 9 | 7 | 21 | 12 | 13 | 8 | <1 | <1 | 2 | 2 | 1 |
| Total dissolved | - | - | - | - | - | 418 | 397 | 440 | 466 | 377 | 335 | 341 | - | 344 | 372 | 335 | 314 |
| Phosphorus, mg/L | | | | | | | | | | | | | | | | | |
| Total phosphate | 0.06 | 0.12 | 0.04 | 0.03 | 0.02 | 0.03 | 0.08 | 0.02 | 0.03 | 0.04 | 0.04 | 0.22 | 0.08 | 0.09 | 0.10 | 0.08 | 0.02 |
| Dissolved phosphate | 0.03 | 0.07 | <0.01 | 0.03 | 0.01 | 0.03 | 0.05 | 0.01 | 0.03 | 0.02 | 0.03 | 0.03 | 0.07 | 0.03 | 0.10 | 0.07 | 0.02 |
| Nitrogen, mg/L | | | | | | | | | | | | | | | | | |
| Ammonia-N | <0.10 | 0.30 | 0.17 | 0.11 | <0.10 | <0.10 | <0.10 | 0.11 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | 0.13 |
| Nitrite-N | 0.03 | <0.01 | <0.01 | 0.06 | <0.01 | 0.02 | 0.02 | 0.01 | 0.03 | 0.03 | 0.01 | <0.01 | <0.01 | 0.01 | 0.02 | <0.01 | <0.01 |
| Nitrate-N | <0.05 | 0.11 | 0.12 | 0.11 | 0.09 | 0.23 | 0.14 | 0.06 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Kjeldahl-N | 1.73 | 1.51 | 0.77 | 0.97 | 0.95 | 0.41 | 0.79 | 1.87 | 1.62 | 1.29 | 1.24 | 0.36 | 0.77 | 0.75 | 0.43 | <0.10 | 0.96 |
| COD, mg/L | 65 | 62 | 40 | 35 | 20 | 31 | 41 | 30 | 61 | <1 | 29 | 22 | 34 | 19 | 17 | 2 | 11 |
| Oil and grease, mg/L | <1 | <1 | 1 | <1 | 1 | <1 | 1 | 1 | 1 | <1 | <1 | - | <1 | <1 | 2 | <1 | <1 |
| Field filtered, µg/L | | | | | | | | | | | | | | | | | |
| Chlorophyll-*a* | 15.50 | 14.50 | 4.96 | 1.48 | 0.90 | 1.77 | 4.08 | 3.23 | - | 5.58 | 9.13 | - | - | 2.42 | 1.19 | 3.29 | 6.55 |
| Chlorophyll-*b* | <3.13 | 9.7 | 0.63 | 1.31 | <0.50 | 0.63 | 1.20 | 0.87 | - | 1.54 | 9.26 | - | - | 2.48 | 2.23 | 1.88 | 1.78 |
| Chlorophyll-*c* | 7.79 | <2.7 | 1.24 | 1.14 | <0.50 | 0.84 | 0.98 | 1.22 | - | <1.00 | 4.05 | - | - | 0.62 | 4.38 | 1.38 | 3.34 |
| Pheophytin-*a* | 8.68 | 3.8 | <0.50 | <0.50 | <0.50 | <0.50 | <0.83 | <0.50 | - | <1.00 | <1.67 | - | - | 1.58 | <0.50 | 3.34 | 6.94 |
| Laboratory filtered, µg/L | | | | | | | | | | | | | | | | | |
| Chlorophyll-*a* | - | - | - | - | <0.50 | 1.42 | 5.01 | 2.59 | 7.64 | 6.19 | 6.71 | 4.95 | 3.28 | 5.87 | 5.70 | - | - |
| Chlorophyll-*b* | - | - | - | - | 5.03 | 0.71 | 1.36 | 1.69 | <2.50 | 2.37 | 4.30 | 3.77 | 2.83 | 3.05 | 5.54 | - | - |
| Chlorophyll-*c* | - | - | - | - | 5.07 | 1.12 | 1.41 | 1.82 | 8.05 | 1.35 | 2.79 | 8.23 | 1.64 | 2.24 | 13.70 | - | - |
| Pheophytin-*a* | - | - | - | - | <0.50 | <0.50 | <0.83 | <0.50 | <2.50 | <1.00 | <1.00 | <1.00 | 1.07 | 0.97 | <0.83 | - | - |

Table 2-7. Physical and Chemical Characteristics of Lake George Surficial Sediment Samples (1993), R.K. Raman et al., 1996.

| *Parameters* | *North Basin* | | | *South Basin* | | | | *Indiana maximum background concentration* | *Illinois maximum background concentration* |
|---|---|---|---|---|---|---|---|---|---|
| | *LGN* | *LGN1* | *LGN2* | *LGS* | *LGS1* | *LGS2* | *LGO* | | |
| **Metals, mg/kg** | | | | | | | | | |
| Cadmium | 1.36 | 4.04 | 0.66 | 1.20 | <0.50 | <0.50 | 0.59 | 1.0 | 1.8 |
| Chromium | 7.60 | 6.00 | 6.05 | 19.90 | 4.77 | 3.57 | 16.10 | 50 | 30 |
| Copper | 59.5 | 293.0 | 46.5 | 40.1 | 8.42 | 21.3 | 36.3 | 20 | 100 |
| Iron | 5,340 | 8,900 | 4,360 | 6,240 | 3,540 | 4,150 | 4,890 | 57,000 | 36,000 |
| Lead | 119.0 | 195.0 | 56.0 | 107.0 | 21.6 | 20.0 | 70.6 | 150 | 100 |
| Manganese | 347 | 134 | 168 | 666 | 279 | 182 | 526 | 1,700 | 3,000 |
| Nickel | 6.01 | 12.80 | 4.50 | 6.17 | 2.50 | 2.96 | 3.65 | 21 | - |
| Silver | <1.00 | <1.00 | <1.00 | <1.00 | <1.00 | <1.00 | <1.00 | <0.5 | - |
| Zinc | 234 | 581 | 103 | 199 | 61 | 49 | 141 | 130 | 175 |
| **Other Parameters** | | | | | | | | | |
| Total phosphorus-P, mg/kg | 148 | 199 | 142 | 162 | 168 | 142 | 141 | | 1,175 |
| Total nitrogen-N, mg/kg | 1,000 | 760 | 1,280 | 1,360 | 270 | 240 | 1,220 | | - |
| COD, mg/kg | 25,000 | 21,500 | 16,000 | 22,100 | 9,580 | 4,780 | 14,700 | | 162,000 |
| Total solids, % | 36.0 | 29.6 | 25.6 | 19.1 | 69.7 | 75.3 | 19.4 | | - |
| Volatile solids, % | 5 | 20 | 14 | 13 | 1 | 0.7 | 16 | | 13 |
| TOC, mg/kg | 3,900 | 4,100 | 4,900 | 3,300 | 650 | 1,300 | 3,500 | | 65,500 |
| Density, g/mL | 1.35 | 1.24 | 1.18 | 1.14 | 1.85 | 1.84 | 1.15 | | |

Notes:
LGN: Fine-grained sand with traces of medium-grained sand, traces of clay, and considerable silt
LGN1: Fine-grained sand, with considerable amount of medium-grained sand, traces and small amounts of silt
LGN2: Fine-grained sand with traces of medium- and coarse-grained sand, traces of clay, and some silt
LGS: Silty loam
LGS1: Fine-grained sand with traces of medium-grained sand, clay, and silt
LGS2: Fine-grained sand with some coarse-grained sand, fine-grained gravel, and traces of medium-grained sand, silt, and clay
LGO: silt

_____ = Low concern; _____ = Medium concern

**Table 2-8. Physical and Chemical Characteristics of Lake George Core Sediment Samples (1993), modified from R.K. Raman, et. al., 1996.**

| *Parameters** | LGS Top | LGS Middle | LGS Bottom | LGS1 Top | LGS1 Middle | LGS1 Bottom | LGS2 Top | LGS2 Middle | LGS2 Bottom |
|---|---|---|---|---|---|---|---|---|---|
| Other Parameters | | | | | | | | | |
| Total Phosphorus-P, mg/kg | 209.0 | 60.3 | 121.0 | 103.0 | 113.0 | 113.0 | 114.0 | 117.0 | 129.0 |
| Total nitrogen-N, mg/kg | 1,060 | 780 | 130 | 160 | 110 | 200 | 120 | 88 | 78 |
| COD, mg/kg | 69,300 | 47,000 | 21,000 | 8,040 | 27,300 | 23,400 | 9,580 | 9,260 | 4,260 |
| Total solids, % | 25.8 | 67.9 | 77.7 | 76.2 | 70.4 | 71.6 | 78.0 | 79.7 | 79.7 |
| Volatile solids, % | **17** | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| TOC, mg/kg | 19,000 | 9,500 | 1,500 | 1,200 | 10,000 | 3,200 | 3,200 | 9,300 | 2,100 |
| Density, g/mL | 1.20 | 1.68 | 1.89 | 1.87 | 1.89 | 1.87 | 1.92 | 1.93 | 1.86 |

| | LGO Top | LGO Middle | LGO Bottom |
|---|---|---|---|
| Metals, mg/kg | | | |
| Cadmium | 1.02 | 1.23 | 1.39 |
| Chromium | 18.4 | 25.2 | 30.3 |
| Copper | 39.10 | 41.1 | 51.1 |
| Iron | 5,510 | 7,550 | 9,090 |
| Lead | 80.4 | 130.0 | **152.0** |
| Manganese | 601 | 756 | 852 |
| Nickel | 4.15 | 6.62 | 7.90 |
| Silver | <1.00 | <1.00 | <1.00 |
| Zinc | 163.0 | **242.0** | **294.0** |
| Other Parameters | | | |
| Total Phosphorus-P, mg/kg | 127.0 | 172.0 | 194.0 |
| Total nitrogen-N, mg/kg | 740 | 540 | 460 |
| COD, mg/kg | 29,100 | 65,400 | 73,400 |
| Total solids, % | 19.9 | 19.2 | 32.2 |
| Volatile solids, % | **14** | **14** | **14** |
| TOC, mg/kg | 17,000 | 8,500 | 9,300 |
| Density, g/mL | 1.13 | 1.16 | 1.17 |

NOTES:

Values in parentheses are the maximum background concentrations in Indiana.

Bold values represent those which exceed background.

**Table 2-8. Physical and Chemical Characteristics of Lake George Core Sediment Samples (1993), modified from R.K. Raman, et. al., 1996.**

| | *LGN* | | | *LGN1* | | | *LGN2* | | |
|---|---|---|---|---|---|---|---|---|---|
| *Parameters** | Top | Middle | Bottom | Top | Middle | Bottom | Top | Middle | Bottom |
| Metals, mg/kg | | | | | | | | | |
| Cadmium (1.0) | **2.17** | <0.50 | <0.50 | 0.62 | 0.69 | <0.50 | 0.99 | 0.83 | 0.52 |
| Chromium (50) | 12.00 | 2.31 | 2.75 | 3.81 | 5.04 | 8.62 | 7.45 | 5.10 | 3.43 |
| Copper (20) | 87.4 | 2.08 | 1.54 | 69.60 | **121.00** | 7.10 | 73.00 | 81.80 | 93.40 |
| Iron (57,000) | 6,910 | 2,710 | 2,830 | 4,210 | 7,730 | 5,970 | 6,450 | 6,780 | 5,420 |
| Lead (150) | **197** | 6.2 | 5.00 | 53.5 | 45.1 | <5.0 | 86.9 | 85.4 | 89.3 |
| Manganese (1700) | 395 | 134 | 162 | 179 | 151 | 166 | 268 | 169 | 130 |
| Nickel (21) | 7.81 | 2.05 | 2.56 | 4.17 | 5.98 | 3.78 | 5.68 | 5.22 | 4.40 |
| Silver (<0.5) | <1.00 | <1.00 | <1.00 | <1.00 | <1.00 | <1.00 | <1.00 | <1.00 | <1.00 |
| Zinc (130) | **337.0** | 16.2 | 7.2 | 175.0 | 146.0 | 18.7 | 148.0 | 103.7 | 82.7 |
| Other Parameters | | | | | | | | | |
| Total Phosphorus-P, mg/kg (225) | 49.4 | 72.0 | 31.5 | 21.4 | 34.9 | 88.4 | 102.0 | 233.0 | 191.0 |
| Total nitrogen-N, mg/kg | 950 | 430 | 420 | 350 | 1,030 | 350 | 1,200 | 1,310 | 1,250 |
| COD, mg/kg (162,000) | 55,400 | 16,200 | 39,900 | 3,760 | 120,000 | 8,940 | 43,400 | 49,600 | 75,800 |
| Total solids, % | 59.4 | 66.4 | 71.8 | 77.9 | 65.3 | 73.6 | 46.5 | 58.2 | 54.2 |
| Volatile solids, % (13) | 3 | 2 | 2 | 1 | 3 | 3 | 7 | 9 | 13 |
| TOC, mg/kg (65,500) | 2,800 | 2,900 | 7,300 | 7,800 | 3,300 | 2,000 | 14,000 | 8,800 | 13,000 |
| Density, g/mL | 1.51 | 1.78 | 1.81 | 1.92 | 1.58 | 1.92 | 1.38 | 1.59 | 1.53 |

| | *LGS* | | | *LGS1* | | | *LGS2* | | |
|---|---|---|---|---|---|---|---|---|---|
| *Parameters** | Top | Middle | Bottom | Top | Middle | Bottom | Top | Middle | Bottom |
| Metals, mg/kg | | | | | | | | | |
| Cadmium | **2.12** | 1.11 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| Chromium | 32.20 | 18.9 | 1.61 | 4.69 | 2.81 | 2.78 | 3.20 | 2.21 | 2.64 |
| Copper | 63.9 | 25.1 | 1.18 | 7.99 | 13.20 | 10.2 | 14.7 | 3.13 | 1.45 |
| Iron | 9,900 | 7,310 | 2,020 | 3,500 | 4,600 | 3,490 | 3,660 | 2,230 | 2,480 |
| Lead | **163.0** | 94.1 | 5.2 | 2.3 | 19.3 | 13.2 | 10.1 | 5.9 | 5.0 |
| Manganese | 1,010 | 478 | 108 | 293 | 190 | 166 | 128 | 86 | 109 |
| Nickel | 9.89 | 6.12 | <2.00 | 2.77 | 2.55 | 2.36 | <2.00 | 2.04 | 2.14 |
| Silver | <1.00 | <1.00 | <1.00 | <1.00 | <1.00 | <1.00 | <1.00 | <1.00 | <1.00 |
| Zinc | **309.0** | 174.0 | 10.0 | 63.7 | 68.8 | 31.4 | 19.8 | 16.9 | 7.9 |

NOTES:

Values in parentheses are the maximum background concentrations in Indiana.

Bold values represent those which exceed background.

Table 2-9. Results of Toxicity Characteristics Leaching Procedure (TCLP), R.K. Raman et al., 1996.

| | LGN | LGN1 | LGS | LGS1 | LGS2 | LGO | Regulatory limit, mg/L |
|---|---|---|---|---|---|---|---|
| TCLP metals, mg/L | | | | | | | |
| Cadmium | 0.042 | 0.024 | 0.032 | 0.020 | <0.005 | 0.016 | 1.0 |
| Chromium | 0.021 | <0.010 | 0.040 | 0.045 | <0.010 | <0.010 | 5.0 |
| Copper | 0.013 | 0.367 | 0.039 | 0.076 | 0.095 | 0.025 | - |
| Iron | 43.9 | <0.100 | 36.0 | 46.3 | 0.464 | 0.821 | - |
| Lead | 4.33 | 1.08 | 2.23 | 1.36 | 0.182 | 0.346 | 5.0 |
| Manganese | 12.9 | 2.45 | 28.0 | 19.4 | 5.37 | 17.4 | - |
| Nickel | 0.064 | 0.046 | 0.047 | 0.045 | <0.020 | 0.039 | - |
| Silver | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | 0.025 | - |
| Zinc | 8.18 | 4.60 | 5.35 | 3.69 | 0.903 | 3.85 | - |
| TCLP PCBs, mg/L | | | | | | | |
| Aroclor-1016 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | |
| Aroclor-1221 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | |
| Aroclor-1232 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | |
| Aroclor-1242 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | |
| Aroclor-1248 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | |
| Aroclor-1254 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | |
| Aroclor-1260 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | |
| TCLP pesticides, mg/L | | | | | | | |
| Aldrin | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | |
| Dieldrin | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | |
| 4,4'-DDE | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | |
| Endrin | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | 0.02 |
| 4,4'-DDD | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | |
| 4,4'-DDT | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | |
| Methoxychlor | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | |
| Alpha-Chlordane | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | |
| Gamma-Chlordane | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | |
| BHC, Alpha | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | |
| BHC, Delta | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | |
| BHC, G (Lindane) | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | 0.4 |
| Hexachlorobenzene | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | |
| Pentachlorphenol | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | |

**Table 3-1. Soil Gas Survey Analytical Results, Federated Metals, Hammond, Indiana.**

| Sample Description | Location | Date Analyzed | 1,1-DICHLOROETHENE | 1,1-DICHOLORETHANE | CIS-1,2-DICHOLORETHENE | 1,1,1-TRICHOLORETHANE | TRICHOROETHENE | TETRACHOLORETHENE | BENZENE | TOLUENE | ETHYLBENZENE | TOTAL XYLENES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reporting Limits(ug/L) | | | 0.05 | 0.5 | 0.05 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1 | 0.2 | 0.3 |
| SG-01-1.5' | 1 | 11/14/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-02-2' | 2 | 11/14/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-03-2' | 3 | 11/14/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-04-1.5' | 4 | 11/14/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-05-2' | 5 | 11/14/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-06-2' | 6 | 11/14/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-07-2' | 7 | 11/14/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-08-1.5' | 8 | 11/14/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-09-1.5' | 9 | 11/14/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-10-2' | 10 | 11/14/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-11-2' | 11 | 11/14/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-12-2' | 12 | 11/14/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| ***SG-12'DUP*** | ***12**** | 11/14/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-13-1.5' | 13 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-14-2' | 14 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-15-2' | 15 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-16-1.5' | 16 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-17-1.5' | 17 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-18-2' | 18 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-19-2' | 19 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-20-2' | 20 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-21-2' | 21 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-22-2' | 22 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-23-2' | 23 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-24-2' | 24 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-25-2' | 25 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-26-2' | 26 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-27-2' | 27 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-28-2' | 28 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-29-2' | 29 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-30-2' | 30 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-31-2' | 31 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-32-2' | 32 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| ***SG-32-2'DUP*** | ***32**** | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-33-2' | 33 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-34-2' | 34 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-35-2' | 35 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-36-2' | 36 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-37-2' | 37 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-38-2' | 38 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-39-1.5' | 39 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-40-2' | 40 | 11/15/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-41-2' | 41 | 11/16/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-42-2' | 42 | 11/16/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-43-1.5' | 43 | 11/16/94 | ND | ND | ND | ND | ND | ND | ***0.1*** | ***0.2*** | ND | ND |

**Table 3-1. Soil Gas Survey Analytical Results, Federated Metals, Hammond, Indiana.**

| Sample Description | Location | Date Analyzed | 1,1-DICHLOROETHENE | 1,1-DICHOLORETHANE | CIS-1,2-DICHLORETHENE | 1,1,1-TRICHLORETHANE | TRICHOROETHENE | TETRACHLORETHENE | BENZENE | TOLUENE | ETHYLBENZENE | TOTAL XYLENES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reporting Limits(ug/L) | | | 0.05 | 0.5 | 0.05 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1 | 0.2 | 0.3 |
| SG-44-2' | 44 | 11/16/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-45-2' | 45 | 11/16/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-46-2' | 46 | 11/16/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-47-2' | 47 | 11/16/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-48-2' | 48 | 11/16/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-49-2' | 49 | 11/16/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-50-2' | 50 | 11/16/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-51-2' | 51 | 11/16/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-52-2' | 52 | 11/16/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-53-2' | 53 | 11/16/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-54-2' | 54 | 11/16/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-55-2' | 55 | 11/16/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-56-2' | 56 | 11/16/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-57-1.5' | 57 | 11/16/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-58-1.5' | 58 | 11/16/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-59-1.5' | 59 | 11/16/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-60-2' | 60 | 11/16/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| ***SG-60-2'DUP*** | ***60**** | 11/16/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-61-94 | 61 | 11/16/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-62-2' | 62 | 11/16/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-63-2' | 63 | 11/17/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-64-2' | 64 | 11/17/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-65-2' | 65 | 11/17/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-66-2' | 66 | 11/17/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-67-1.5' | 67 | 11/17/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-68-1.5' | 68 | 11/17/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-69-2' | 69 | 11/17/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-70-2' | 70 | 11/17/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-71-2' | 71 | 11/17/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-72-2' | 72 | 11/17/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-73-2' | 73 | 11/17/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-74-2' | 74 | 11/17/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-75-2' | 75 | 11/17/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-76-2' | 76 | 11/17/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-77-2' | 77 | 11/17/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-78-2' | 78 | 11/17/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-79-2' | 79 | 11/17/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-80-2' | 80 | 11/17/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-81-2' | 81 | 11/17/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-82-2' | 82 | 11/17/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| ***SG-82-2'DUP*** | ***82**** | 11/17/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-83-2' | 83 | 11/17/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-84-2' | 84 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-85-2' | 85 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-86-2' | 86 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |

**Table 3-1. Soil Gas Survey Analytical Results, Federated Metals, Hammond, Indiana.**

| Sample Description | Location | Date Analyzed | 1,1-DICHLOROETHENE | 1,1-DICHOLORETHANE | CIS-1,2-DICHOLORETHENE | 1,1,1-TRICHOLORETHANE | TRICHOROETHENE | TETRACHOLORETHENE | BENZENE | TOLUENE | ETHYLBENZENE | TOTAL XYLENES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reporting Limits(ug/L) | | | 0.05 | 0.5 | 0.05 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1 | 0.2 | 0.3 |
| SG-87-2' | 87 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-88-2' | 88 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-89-2' | 89 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-90-2' | 90 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-91-2' | 91 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-92-2' | 92 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-93-2' | 93 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-94-2' | 94 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-95-2' | 95 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-96-2' | 96 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-97-2' | 97 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-98-2' | 98 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-99-2' | 99 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-100-2' | 100 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-101-2' | 101 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-102-2' | 102 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-103-2' | 103 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| ***SG-103-2'DUP*** | ***103**** | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-104-2' | 104 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-105-2' | 105 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-106-2' | 106 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-107-2' | 107 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-108-2' | 108 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-109-2' | 109 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-110-2' | 110 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-111-2' | 111 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-112-2' | 112 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-113-2' | 113 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-114-2' | 114 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-115-2' | 115 | 11/18/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-116-2' | 116 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-117-2' | 117 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-118-2' | 118 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-119-2' | 119 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-120-2' | 120 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-121-2' | 121 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-122-2' | 122 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-123-2' | 123 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-124-2' | 124 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| ***SG-124-2'DUP*** | ***124**** | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-125-2' | 125 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-126-2' | 126 | 11/19/94 | ND | ND | ND | ND | ND | ***0.04*** | ND | ND | ND | ND |
| SG-127-2' | 127 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-128-2' | 128 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-129-2' | 129 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |

**Table 3-1. Soil Gas Survey Analytical Results, Federated Metals, Hammond, Indiana.**

| Sample Description | Location | Date Analyzed | 1,1-DICHLOROETHENE | 1,1-DICHOLORETHANE | CIS-1,2-DICHOLORETHENE | 1,1,1-TRICHOLORETHANE | TRICHOROETHENE | TETRACHOLORETHENE | BENZENE | TOLUENE | ETHYLBENZENE | TOTAL XYLENES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reporting Limits(ug/L) | | | 0.05 | 0.5 | 0.05 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1 | 0.2 | 0.3 |
| SG-130-2' | 130 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-131-2' | 131 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-132-2' | 132 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-133-2' | 133 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-134-2' | 134 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-135-2' | 135 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-136-2' | 136 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-137-2' | 137 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-138-2' | 138 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-139-2' | 139 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-140-2' | 140 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-141-2' | 141 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-142-2' | 142 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-143-2' | 143 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-144-2' | 144 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-145-2' | 145 | 11/19/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-146-2' | 146 | 11/20/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-147-2' | 147 | 11/20/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-148-2' | 148 | 11/20/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-149-2' | 149 | 11/20/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-150-2' | 150 | 11/20/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-151-2' | 151 | 11/20/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-152-2' | 152 | 11/20/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-153-2' | 153 | 11/20/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-154-2' | 154 | 11/20/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| *SG-154-2'DUP* | *154** | 11/20/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-155-2' | 155 | 11/20/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-156-2' | 156 | 11/20/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-157-2' | 157 | 11/20/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-158-2' | 158 | 11/20/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-159-2' | 159 | 11/20/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-160-2' | 160 | 11/20/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-161-2' | 161 | 11/20/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-162-2' | 162 | 11/20/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-163-2' | 163 | 11/20/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-164-2' | 164 | 11/20/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-165-2' | 165 | 11/20/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-166-2' | 166 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-167-2' | 167 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-168-2' | 168 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-169-2' | 169 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-170-2' | 170 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-171-1.5' | 171 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-172-1.5' | 172 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-173-1.5' | 173 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |

**Table 3-1. Soil Gas Survey Analytical Results, Federated Metals, Hammond, Indiana.**

| Sample Description | Location | Date Analyzed | 1,1-DICHLOROETHENE | 1,1-DICHLORETHANE | CIS-1,2-DICHLORETHENE | 1,1,1-TRICHLORETHANE | TRICHOROETHENE | TETRACHLORETHENE | BENZENE | TOLUENE | ETHYLBENZENE | TOTAL XYLENES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reporting Limits(ug/L) | | | 0.05 | 0.5 | 0.05 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1 | 0.2 | 0.3 |
| SG-174-1.5' | 174 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-175-2' | 175 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-176-2' | 176 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-177-S' | 177 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-178-2' | 178 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| ***SG-178-2'DUP*** | ***178**** | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-179-2' | 179 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-180-2' | 180 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-181-2' | 181 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-182-2' | 182 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-183-2' | 183 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-184-2' | 184 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-185-2' | 185 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-186-2' | 186 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-187-2' | 187 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-188-2' | 188 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-189-2' | 189 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-190-2' | 190 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-191-2' | 191 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-192-2' | 192 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-193-2' | 193 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-194-2' | 194 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-195-2' | 195 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-196-2' | 196 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-197-2' | 197 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-198-2' | 198 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-199-2' | 199 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-200-2' | 200 | 11/21/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-201-1.5' | 201 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-202-2' | 202 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-203-2' | 203 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-204-2' | 204 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-205-2' | 205 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-206-2' | 206 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-207-2' | 207 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-208-2' | 208 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-209-2' | 209 | 11/22/94 | ND | ND | ND | ND | ***0.03*** | ***0.02*** | ND | ND | ND | ND |
| SG-210-2' | 210 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-211-2' | 211 | 11/22/94 | ND | ND | ND | ***0.04*** | ND | ND | ND | ND | ND | ND |
| SG-212-2' | 212 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-213-2' | 213 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-214-2' | 214 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| ***SG-214-2'DUP*** | ***214**** | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-215-2' | 215 | 11/22/94 | ND | ND | ND | ***0.02*** | ND | ND | ND | ND | ND | ND |
| SG-216-2' | 216 | 11/22/94 | ND | ND | ***0.17*** | ND | ND | ND | ND | ND | ND | ND |

**Table 3-1. Soil Gas Survey Analytical Results, Federated Metals, Hammond, Indiana.**

| Sample Description | Location | Date Analyzed | 1,1-DICHLOROETHENE | 1,1-DICHOLORETHANE | CIS-1,2-DICHOLORETHENE | 1,1,1-TRICHOLORETHANE | TRICHOROETHENE | TETRACHOLORETHENE | BENZENE | TOLUENE | ETHYLBENZENE | TOTAL XYLENES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reporting Limits(ug/L) | | | 0.05 | 0.5 | 0.05 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1 | 0.2 | 0.3 |
| SG-217-2' | 217 | 11/22/94 | ND | ND | ND | ***0.02*** | ND | ND | ND | ND | ND | ND |
| SG-218-2' | 218 | 11/22/94 | ND | ND | ND | ***0.07*** | ND | ND | ND | ND | ND | ND |
| SG-219-2' | 219 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-220-2' | 220 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-221-2' | 221 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-222-1.5' | 222 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-223-1.5' | 223 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-224-1.5' | 224 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-225-1.5' | 225 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-226-1.5' | 226 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-227-1.5' | 227 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-228-1.5' | 228 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-229-1.5' | 229 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-230-1.5' | 230 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-231-1.5' | 231 | 11/22/94 | ND | ND | ND | ***0.01*** | ND | ND | ND | ND | ND | ND |
| SG-232-1.5' | 232 | 11/22/94 | ND | ND | ND | ***0.02*** | ND | ND | ND | ND | ND | ND |
| SG-233-1.5' | 233 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-234-1.5' | 234 | 11/22/94 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |

DUP = duplicate
* = duplicate location
ND = not detected

Table 3-2. Analytical Results for Total Metals, Fluoride, and Total Cyanide - SWMUs #1 and #2 Waste characterization Samples, Federated Metals, Hammond, Indiana.

| | | | | PARAMETERS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory ID | Sample I.D. | Location | Date | Silver | Barium | Beryllium | Cadmium | Cobalt | Chromium | Copper | Nickel | Antimony | Vanadium | Zinc |
| A5F070002-001 A5F070002-016 | FMWSWG COMPOSITE (8,9,10) | 8,9,10 | 05/26/95 | 6.1 | 259 J | 3.1 | 14.4 | 35.5 | 1,630 | 3280 J | 281 J | 51.2 J | 213 J | 1,060 |
| A5F070002-002 A5F070002-017 | FMWSWG COMPOSITE (11,12,13) | 11,12,13 | 05/26/95 | 2.7 | 1670 J | 68.8 | 7.9 | 46.9 | 2,470 | 8080 J | 471 J | 199 J | 85.6 J | 88,900 |
| A5F070002-003 A5F070002-018 | FMWSWG COMPOSITE (11,12,13) | 11,12,13 (Duplicate) | 05/26/95 | 2.7 | 1670 J | 69.1 | 7.7 | 47.4 | 2,710 | 8030 J | 472 J | 210 J | 86.8 J | 70,000 |
| A5F070002-004 A5F070002-019 | FMWSWG COMPOSITE (14,15,16) | 14,15,16 | 05/26/95 | 2.2 | 860 J | 199 | 18.1 | 97.7 | 4,620 | 14700 J | 927 J | 120 J | 79.3 J | 139,000 |
| A5F070002-005 A5F070002-020 | FMWSWG COMPOSITE (17,18,19) | 17,18,19 | 05/26/95 | 1.1 J | 1020 J | 3.2 | 2.5 | 11.2 | 792 | 223 J | 119 J | 238 J | 94.1 J | 8,990 |
| A5F070002-006 A5F070002-021 | FMWSWG COMPOSITE (20,21,22) | 20,21,22 | 05/26/95 | 2.5 | 228 J | 6.1 | 14.3 | 20.5 | 572 | 5080 J | 317 J | 97.2 J | 34 J | 9,160 |
| A5F070002-007 A5F070002-022 | FMWSWG COMPOSITE (23,24,25) MS/MSD | 23,24,25 | 05/26/95 | 27.1 | 75 J | 5.0 | 1,180 | 5.6 J | 92.2 | 14600 J | 223 J | 464 J | 12 J | 480,000 |
| A5F070002-008 A5F070002-023 | FMWSWG COMPOSITE (26,27,28) | 26,27,28 | 05/26/95 | 1.5 J | 2830 J | 20.5 | 46.9 | 14.1 | 837 | 2740 J | 56.8 J | 696 J | 80 J | 24,500 |
| A5F070002-009 A5F070002-024 | FMWSWG COMPOSITE (29,30,31) | 29,30,31 | 05/26/95 | 3.6 | 5000 J | 13.2 | 12.0 | 18.6 | 818 | 4570 J | 123 J | 4750 J | 37 J | 12,500 |
| A5F070002-010 A5F070002-025 | FMWSWG COMPOSITE (32,33,34) | 32,33,34 | 05/26/95 | 19.8 | 91.9 J | 10 U | 1,390 | 7.3 J | 151 | 6920 J | 71.1 J | 2490 J | 14.2 J | 391,000 |
| A5F070002-011 A5F070002-026 | FMWSWG COMPOSITE (32,33,34) | 32,33,34 (Duplicate) | 05/26/95 | 19.8 | 91.1 J | 10.1 U | 1,410 | 7.7 J | 133 | 6960 J | 72.5 J | 2410 J | 13.7 J | 393,000 |
| A5F070002-012 A5F070002-027 | FMWSWG COMPOSITE (35,36,37) | 35,36,37 | 05/26/95 | 19.0 | 849 J | 9.1 U | 428 | 30.8 | 261 | 52100 J | 604 J | 2090 J | 48.3 J | 164,000 |
| A5C030054-001 | FMGWMWB (MS/MSD) | Equipment Blank | 03/02/95 | <10.0 | <10.0 | <5.0 | <10.0 | <50.0 | <20.0 | <10.0 | <40.0 | <300 | <50.0 | <50.0 |

Notes:
Sample preparation by ASARCO, Salt Lake City, Utah
Samples analyzed by Quanterra, Inc., North Canton, Ohio.
Metals by SW846 Method 6010A
Fluoride by MCAWW 340.2
Cyanide (total) by SW846 Method 9012
Analytical results for waste samples reported in mg/kg
Analytical results for water (equipment blank) sample reported in ug/L
J - Estimated, detected.
UJ - Estimated, not detected.

Table 3-2. Analytical Results for Total Metals, Fluoride, and Total Cyanide - SWMUs #1 and #2 Waste characterization Samples, Federated Metals, Hammond, Indiana.

| | | | | PARAMETERS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory ID | Sample I.D. | Location | Date | Arsenic | Arsenic AA | Lead | Mercury | Selenium | Selenium AA | Thallium | Tin | Fluoride | Cyanide (Total) |
| A5F070002-001 A5F070002-016 | FMWSWG COMPOSITE (8,9,10) | 8,9,10 | 05/26/95 | NR | 52.8 | 14,400 | <0.10 | 91.4 J | NR | 14.0 UJ | 231 J | 30 J | <0.25 |
| A5F070002-002 A5F070002-017 | FMWSWG COMPOSITE (11,12,13) | 11,12,13 | 05/26/95 | NR | 3.8 B | 3,950 | <0.10 | NR | 4.5 J | 14.0 UJ | 13,300 | 8600 J | <0.25 |
| A5F070002-003 A5F070002-018 | FMWSWG COMPOSITE (11,12,13) | 11,12,13 (Duplicate) | 05/26/95 | NR | NR | 3,990 | <0.10 | NR | NR | 14.0 UJ | 13,400 | 17000 J | <0.25 |
| A5F070002-004 A5F070002-019 | FMWSWG COMPOSITE (14,15,16) | 14,15,16 | 05/26/95 | NR | 3.0 B | 6,600 | <0.10 | 78.3 J | NR | 14.0 UJ | 7,430 | 1100 J | <0.25 |
| A5F070002-005 A5F070002-020 | FMWSWG COMPOSITE (17,18,19) | 17,18,19 | 05/26/95 | NR | 22.7 | 11,700 | <0.10 | NR | 0.86 J | 14.0 UJ | 3,630 | 10000 J | <0.25 |
| A5F070002-006 A5F070002-021 | FMWSWG COMPOSITE (20,21,22) | 20,21,22 | 05/26/95 | NR | 14.0 | 1,780 | 0.27 | NR | 3.7 J | 14.0 UJ | 1,640 | 260 J | 0.42 |
| A5F070002-007 A5F070002-022 | FMWSWG COMPOSITE (23,24,25) MS/MSD | 23,24,25 | 05/26/95 | 122 J | NR | 99,800 | 7.3 | NR | 20.1 J | 14.0 UJ | 10,800 | 1200 J | <0.25 |
| A5F070002-008 A5F070002-023 | FMWSWG COMPOSITE (26,27,28) | 26,27,28 | 05/26/95 | 386 | NR | 6,880 | <0.10 | NR | 3.6 J | 14.0 UJ | NR | 12000 J | <0.25 |
| A5F070002-009 A5F070002-024 | FMWSWG COMPOSITE (29,30,31) | 29,30,31 | 05/26/95 | 291 J | NR | 15,900 | 0.1 | 69 J | NR | 14.0 UJ | 15,900 | 240 J | <0.25 |
| A5F070002-010 A5F070002-025 | FMWSWG COMPOSITE (32,33,34) | 32,33,34 | 05/26/95 | 308 J | NR | 117,000 | 11.2 | 78.1 J | NR | 14.0 UJ | 40,400 | 6600 J | <0.25 |
| A5F070002-011 A5F070002-026 | FMWSWG COMPOSITE (32,33,34) | 32,33,34 (Duplicate) | 05/26/95 | 294 J | NR | 122,000 | 11.4 | 70.7 J | NR | 24.9 J | 39,000 | 3600 J | <0.25 |
| A5F070002-012 A5F070002-027 | FMWSWG COMPOSITE (35,36,37) | 35,36,37 | 05/26/95 | 147 J | NR | 63,500 | 1.8 | NR | 11.J | 14.0 UJ | 6,130 | 2200 J | <0.25 |
| A5C030054-001 | FMGWMWB (MS/MSD) | Equipment Blank | 03/02/95 | <5.0 | NR | <3.0 | <0.20 | <5.0 | NR | <10.0 | <1,000 | <1,200 | <5 |

Notes:
Sample preparation by ASARCO, Salt Lake City, Utah
Samples analyzed by Quanterra, Inc., North Canton, Ohio.
Metals by SW846 Method 6010A
Fluoride by MCAWW 340.2
Cyanide (total) by SW846 Method 9012
Analytical results for waste samples reported in mg/kg
Analytical results for water (equipment blank) sample reported in ug/L
J - Estimated, detected.
UJ - Estimated, not detected.

Table 3-3. Analytical Results for Metals by TCLP - SWMUs #1 and #2 Waste Characterization Samples, Federated Metals, Hammond, Indiana.

| | | | | PARAMETERS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory ID | Sample I.D. | Location | Date | Silver | Arsenic | Barium | Cadmium | Chromium | Lead | Selenium | Mercury |
| A5F070002-028 | FMWSWG COMPOSITE (8,9,10) | 8,9,10 | 05/26/95 | <0.10 | <0.50 | <1.0 | <0.10 | <0.10 | <0.10 | <0.30 | <0.020 |
| A5F070002-029 | FMWSWG COMPOSITE (11,12,13) | 11,12,13 | 05/26/95 | <0.10 | <0.50 | 1.1 | <0.10 | <0.10 | <0.10 | <0.30 | <0.020 |
| A5F070002-030 | FMWSWG COMPOSITE (11,12,13) | 11,12,13 (Duplicate) | 05/26/95 | <0.10 | <0.50 | 1.2 | <0.10 | <0.10 | <0.10 | <0.30 | <0.020 |
| A5F070002-031 | FMWSWG COMPOSITE (14,15,16) | 14,15,16 | 05/26/95 | <0.10 | <0.50 | 1.5 | <0.10 | <0.10 | 1.3 | <0.30 | <0.020 |
| A5F070002-032 | FMWSWG COMPOSITE (17,18,19) | 17,18,19 | 05/26/95 | <0.10 | <0.50 | <1.0 | <0.10 | <0.10 | 0.36 | <0.30 | <0.020 |
| A5F070002-033 | FMWSWG COMPOSITE (20,21,22) | 20,21,22 | 05/26/95 | <0.10 | <0.50 | <1.0 | 0.27 | <0.10 | 40.9 | <0.30 | <0.020 |
| A5F070002-034 | FMWSWG COMPOSITE (23,24,25) | 23,24,25 | 05/26/95 | <0.10 | <0.50 | <1.0 | 9.8 | <0.10 | 14.3 | <0.30 | <0.020 |
| A5F070002-035 | FMWSWG COMPOSITE (26,27,28) | 26,27,28 | 05/26/95 | <0.10 | <0.50 | 3.1 | <0.10 | <0.10 | <0.10 | <0.30 | <0.020 |
| A5F070002-036 | FMWSWG COMPOSITE (29,30,31) | 29,30,31 | 05/26/95 | <0.10 | <0.50 | 1.9 | <0.10 | <0.10 | 0.86 | <0.30 | <0.020 |
| A5F070002-037 | FMWSWG COMPOSITE (32,33,34) | 32,33,34 | 05/26/95 | <0.10 | <0.50 | <1.0 | 6.3 | <0.10 | 36.4 | <0.30 | <0.020 |
| A5F070002-038 | FMWSWG COMPOSITE (32,33,34) | 32,33,34 (Duplicate) | 05/26/95 | <0.10 | <0.50 | <1.0 | 7.2 | <0.10 | 78.4 | <0.30 | <0.020 |
| A5F070002-039 | FMWSWG COMPOSITE (35,36,37) | 35,36,37 | 05/26/95 | <0.10 | <0.50 | <1.0 | 4.4 | <0.10 | 16.7 | <0.30 | <0.020 |

Notes:

Samples analyzed by Quanterra, Inc., North Canton, Ohio.

Analysis for metals performed in accordance with USEPA Toxicity Characteristic Leaching Procedure Method 1311.

Analytical results reported in mg/L.

Table 3-4. Analytical Results for Total Metals - SWMU #8 Waste Characterization Samples, Federated Metals, Hammond, Indiana.

| | | | | PARAMETERS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory ID | Sample I.D. | Location | Date | Silver | Barium | Cadmium | Chromium | Arsenic | Lead | Mercury | Selenium |
| A5A300032-014<br>A5A300032-023 | FMWSWG COMPOSITE (1,2,3) | 1,2,3 | 01/23/95 | 13.8 J | 356 J | 1480 J | 66.4 J | 693 J | 54200 J | 88.0 J | 389 J |
| A5A300032-015 | FMWSWG COMPOSITE (1,2,3) | 1,2,3 (Duplicate) | 01/23/95 | 11.6 J | 366 J | 1570 J | 137 J | 660 J | 63500 J | NA | 429 J |
| A5A300032-016<br>A5F070002-025 | FMWSWG COMPOSITE (4,5,6) | 4,5,6 | 01/23/95 | 10.2 J | 384 J | 871 J | 233 J | 393 J | 64600 J | 88.2 J | 11.3 J |
| A5A300032-017 | FMWSWG COMPOSITE (4,5,6) | 4,5,6 (Duplicate) | 01/23/95 | 5.4 J | 392 J | 928 J | 254 J | 390 J | 62600 J | NA | 23.2 J |
| A5A300032-019<br>A5F070002-028 | FMWSWG 7 | 7 | 01/23/95 | <2.0 J | 20.6 J | 463 J | 27.2 J | 16 J | 6070 J | 0.37 | <1.0 J |
| A5A300032-020 | FMWSWG 7 | 7 (Duplicate) | 01/23/95 | <2.0 J | 18.8 J | 429 J | 26 J | 16.1 J | 5700 J | NA | 1.5 J |
| A5A300032-029 | FMWSWGA | Equipment Blank | 01/03/95 | <10.0 | <10.0 | <10.0 | <20.0 | <5.0 | <3.0 | <0.20 | <5.0 |

Notes:
Sample preparation by ASARCO, Salt Lake City, Utah

Samples analyzed by Quanterra, Inc., North Canton, Ohio.
Analytical results for waste samples reported in mg/kg
Analytical results for water (equipment blank) sample reported in ug/L
J - Estimated.

Table 3-5. Analytical Results for Metals by TCLP - SWMU #8 Waste Characterization Samples, Federated Metals, Hammond, Indiana.

| | | | | PARAMETERS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory ID | Sample I.D. | Location | Date | Silver | Barium | Cadmium | Chromium | Arsenic | Lead | Mercury | Selenium |
| A5A300032-024 | FMWSWG COMPOSITE (1,2,3) | 1,2,3 | 01/23/95 | <0.10 | <1.0 | 33.4 J | <0.10 | <0.50 | 179 J | <0.020 | <0.30 |
| A5A300032-026 | FMWSWG COMPOSITE (4,5,6) | 4,5,6 | 01/23/95 | <0.10 | <1.0 | 10.8 J | <0.10 | <0.50 | 122 J | 0.023 | <0.30 |
| A5A300032-027 | FMWSWG 7 | 7 | 01/23/95 | <0.10 | <1.0 | 5.0 | <0.10 | <0.50 | 6.6 | <0.020 | <0.30 |

Notes:
Sample preparation by ASARCO, Salt Lake City, Utah

Samples analyzed by Quanterra, Inc., North Canton, Ohio.
Analytical results reported in mg/L.
J - Estimated, detected.

Table 4-1. Near Surface Soil Sample Analytical Results, Federated Metals Corporation, Hammond, Indiana.

| | | | | PARAMETER: Metals — Results in mg/kg | | | | | | | | | | | | | | | | | | | | | | | | | | | | PARAMETER: Fluoride,Total Solids,Total Cyanide — Results in mg/kg | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Silver | Barium | Barium Levels above 95%ucl | Beryllium | Cadmium | Cobalt | Cobalt Levels above 95%ucl | Chromium | Chromium Levels above 95%ucl | Copper | Copper Levels above 95%ucl | Nickel | Copper Levels above 95%ucl | Antimony | Vanadium | Vanadium Levels above 95%ucl | Zinc | Zinc levels above 95%ucl | Arsenic | Arsenic Levels above 95%ucl | Lead | Lead Levels above 95%ucl | Mercury | Selenium | Thallium | Tin | Fluoride | Fluoride Levels above 95%ucl | Solids, Total(TS) | Cyanide, Total |
| A5C250021-001 | FMSONS2/5-7' | SB-2 | 3/24/95 | <1.0 | 31 | | <0.50 | <1.0 | <5.0 | | 8.3 | | 687 | | 12.1 | | <30 | 5.9 | | 743 | | 13.2 | | 252 | | 0.11 | *<1.0 | <1.0 | 117 | 39 | | 77.8 | <0.32 |
| A5C250021-002 | FMSONS1/4.5-5' | SB-1 | 3/24/95 | <1.0 | 7.8 | | <0.50 | <1.0 | <5.0 | | 3.4 | | 2.5 | | <4.0 | | <30.0 | 6.3 | | 13.1 | | 1.2 | | 2.2 | | <0.10 | <0.50 | <1.0 | <100 | 46 | | 76.3 | <0.33 |
| A5C250021-003 | FMSONS21/5.5-6' | SB-21 | 3/24/95 | 1.6 | 219 | | 0.90 | 9.0 | 13.6 | | 22.0 | | 4,320 | | 51.5 | | 234 | 8.1 | | 1,230 | | 11.3 | | 8,740 | | 0.39 | 0.91 S | <1.0 | 3,040 | 27 | | 83.4 | <0.30 |
| A5C250021-004 | FMSONS34/2-2.5' | SB-34 | 3/24/95 | <1.0 | 5.7 | | <0.50 | <1.0 | <5.0 | | 4.7 | | 9.9 | | 4.4 | | <30.0 | 6.7 | | 19.1 | | 2.7 | | 5.3 | | <0.10 | <0.50 | <1.0 | <100 | <23 | | 85.3 | <0.29 |
| A5C250021-005 | FMSONS33/2-2.5' | SB-33 | 3/24/95 | <1.0 | 5.8 | | <.50 | <1.0 | 7.1 | | 6.5 | | 11.4 | | 4.5 | | <30.0 | 6.2 | | 12.7 | | 2.2 | | 4.8 | | <.10 | <.50 | <1.0 | <100 | 43 | | 84.8 | <0.29 |
| A5C250021-006 | FMSONS32/1.5-2' | SB-32 | 3/24/95 | <1.0 | 19.4 | | <0.50 | <1.0 | 8.1 | | 6.9 | | 7.3 | | 5.6 | | <30.0 | 6.5 | | 14.8 | | 5.8 | | 5.1 | | <0.10 | <0.50 | <1.0 | <100 | 31 | | 86.2 | <0.29 |
| A5C250021-007 | FMSONS26/1-3' | SB-26 | 3/24/95 | <1.0 | 5.8 | | <0.50 | 7.4 | 6.4 | | 5.1 | | 44.7 | | 8.9 | | <30.0 | 5 | | 383 | | 2.4 | | 32.7 | | <0.10 | <0.50 | <1.0 | <100 | 31 | | 90.4 | <0.28 |
| A5C250021-008 | FMSONS25/1.5-2' | SB-25 | 3/24/95 | <1.0 | 67.2 | | <0.50 | 1.1 | 7.4 | | 14.1 | | 1,650 | | 108 | | <30.0 | 14.2 | | 1,580 | | 17.7 | | 1,410 | | <0.10 | <0.50 | <1.0 | 311 | 53 | | 84.6 | <0.30 |
| A5C250021-009 | FMGWMWD | EQUIPMENT BLANK | 3/24/95 | <10.0 | <10.0 | | <5.0 | <10.0 | <50.0 | | <20.0 | | <10.0 | | <40.0 | | <300 | <50.0 | | <50.0 | | <5.0 | | <5.0 | | <0.20 | <5.0 | <10.0 | <1,000 | <1.2 | | NA | <0.005 |
| A5C250021-010 | FMSONS11/5.5-6' | SB-11 | 3/23/95 | <1.0 | 4.8 | | <0.50 | 12.2 | <5.0 | | 3.5 | | 18 | | 9.3 | | <30.0 | 5.4 | | 573 | | 2.8 | | 22 | | <0.10 | 0.91+ | <1.0 | <100 | 46 | | 82.9 | <0.30 |
| A5C250021-011 | FMSONS13/5.5-6' | SB-13 | 3/23/95 | <1.0 | 4.2 | | <0.50 | 2.4 | <5.0 | | 3.2 | | 14.6 | | 95.6 | | <30 | 5.2 | | 1,410 | | 1.4 | | 6.7 | | <0.10 | <0.50 | <1.0 | <100 | <25 | | 80.9 | <0.31 |
| A5C250021-012 | FMSONS22/5.5-6' | SB-22 | 3/23/95 | 1.3 | 52.6 | | <0.50 | 8.6 | 8.1 | | 8.5 | | 3,170 | | 26.4 | | <30.0 | 8.7 | | 4,630 | | 5.8 | | 3,500 | | 0.51 | <0.50 | <1.0 | 487 | 110 | | 81.8 | <0.31 |
| A5C250021-013 | FMSONS18/5.5-7.5' | SB-18 | 3/22/95 | <1.0 | 4.9 | | <0.50 | 1.2 | <5.0 | | 4.1 | | 116 | | 5.2 | | <30.0 | <5.0 | | 228 | | 2.4 | | 78.4 | | <0.10 | <0.50 | <1.0 | <100 | 46 | | 82.2 | <0.30 |
| A5C250021-014 | FMSONS50/5.5-7.5' | SB-18(DUP) | 3/22/95 | <1.0 | 5.2 | | <0.50 | 1.4 | <5.0 | | 7.3 | | 105 | | 6.8 | | <30.0 | 6.1 | | 238 | | 2.1 | | 52.2 | | <0.10 | <0.50 | <1.0 | <100 | 110 | | 84.4 | <0.30 |
| A5C250021-015 | FMSONS19/5-7' | SB-19 | 3/22/95 | <1.0 | 7.9 | | <0.50 | 4.1 | <5.0 | | 3.7 | | 59.4 | | 8.3 | | <30.0 | 5.2 | | 1,220 | | 2.6 | | 63 | | <0.10 | <0.50 | <1.0 | <100 | 58 | | 81.0 | <0.31 |
| A5C250021-016 | FMSONS28/6-12" | HASB-28 | 3/22/95 | <1.0 | 8.1 | | <0.50 | <1.0 | <5.0 | | 3.5 | | 175 | | 5.8 | | <30.0 | 5.9 | | 210 | | 1.2 | | 128 | | <0.10 | <0.50 | <1.0 | <100 | 93 | | 87.5 | <0.29 |
| A5C250021-017 | FMSONS27/6-12" | HASB-27 | 3/22/95 | <1.0 | 8.2 | | <0.50 | <1.0 | 5.1 | | 5.8 | | 30.0 | | 6.5 | | <30.0 | 9.6 | | 129 | | 2.6 | | 19.6 | | 0.12 | <0.50 | <1.0 | <100 | 27 | | 91.0 | <0.27 |
| A5C250021-018 | FMSONS51/6-12" | HASB-27(DUP) | 3/22/95 | <1.0 | 5.5 | | <0.50 | <1.0 | 5.1 | | 8.2 | | 16.2 | | 6.4 | | <30.0 | 9.8 | | 95.8 | | 2.2 | | 11.6 | | <0.10 | <0.50 | <1.0 | <100 | 23 | | 93.1 | <0.27 |
| A5C250021-019 | FMSONS29/6-12" | HASB-29 | 3/22/95 | <1.0 | 7.1 | | <0.50 | <1.0 | 5.8 | | 5.4 | | 5.2 | | 4.3 | | <30.0 | 9.4 | | 17.3 | | 2.0 | | 5.9 | | <0.10 | <0.50 | <1.0 | <100 | 270 | | 82.7 | <0.30 |
| A5C250021-020 | FMSONS30/6-12" | HASB-30 | 3/22/95 | <1.0 | 10.3 | | <0.50 | <1.0 | 10.1 | | 12.8 | | 21.1 | | 11.4 | | <30.0 | 11.4 | | 33.8 | | 3.1 | | 9.2 | | <0.10 | <0.50 | <1.0 | <100 | <23 | | 87.6 | <0.29 |
| A5C250021-021 | FMSONS16/6.5-7' | SB-16 | 3/23/95 | | | | | | | | | | | | | | | | | | | | | | | | | | | | NA | 79.5 | NA |
| A5C250021-022 | FMSONS16/7-9' | SB-16 | 3/23/95 | <1.0 | 4.3 | | <0.50 | <1.0 | <5.0 | | 4.2 | | 13.4 | | 18.3 | | <30.0 | <5.0 | | 80.6 | | 1.2 | | 19.6 | | <0.10 | <0.50 | <1.0 | <100 | <24 | | 84.0 | <0.30 |
| A5C250021-023 | FMSONS14/4.5-5' | SB-14 | 3/23/95 | | | | | | | | | | | | | | | | | | | | | | | | | | | | NA | 86.0 | NA |
| A5C250021-025 | FMSONS52/4.5-5' | SB-14(DUP) | 3/23/95 | | | | | | | | | | | | | | | | | | | | | | | | | | | | NA | 89.8 | NA |
| A5C250021-024 | FMSONS14/5-7' | SB-14 | 3/23/95 | 1.5 | 703 | | 2.8 | 6 | 8.1 | | 14.3 | | 4,310 | | 114 | | 82.3 | 12 | | 5,530 | | 11.5 | | 4,840 | | 0.27 | 6.0 + | <1.0 | 688 | 140 | | 80.9 | 0.34 |
| A5C250021-026 | FMSONS52/5-7' | SB-14(DUP) | 3/23/95 | | | | | | | | | | | | | | | | | | | | | | | | | | | | NA | 84.4 | NA |
| A5C250021-027 | FMSONS12/4.5-5' | SB-12 | 3/23/95 | 5.9 | 2,100 | | <0.50 | 20 | 11.6 | | 24.1 | | 15,400 | | 182 | | 73.6 | 20.7 | | 26,700 | | 25.1 | | 36,000 | | 1.5 | 2.5 S | <1.0 | 2,920 | 130 | | 82.0 | <0.30 |
| A5C250021-028 | FMSONS15/6-7' | SB-15 | 3/23/95 | <1.0 | 3.9 | | <0.50 | <1.0 | <5.0 | | 3.0 | | 7.9 | | 129 | | <30 | <5.0 | | 140 | | 1.6 | | 5.4 | | <0.10 | <0.50 | <1.0 | <100 | 360 | | 79.7 | <0.31 |
| A5C220072-001 | FMSONSBG1/12-18" (MS/MSD) | BG-1 (Background Sample) | 3/20/95 | <1.0 | 9.1 | | <0.50 | <1.0 | 10.7 | | 9.6 | | 3.4 | | 5.9 | | <30.0 | 7.3 | | 22.5 | | 2.9 | | 6.4 | | <0.10 | <0.50 | <1.0 | <100 | 33 | | 87.8 | <0.28 |
| A5C220072-002 | FMSONSBG2/6-12" | BG-2 (Background Sample) | 3/20/95 | <1.0 | 13.0 | | <0.50 | <1.0 | 14.2 | | 22.7 | | 4.5 | | 11.4 | | <30.0 | 9 | | 26.4 | | 2.3 | | 8.8 | | <0.10 | <0.50 | <1.0 | <100 | 45 | | 94.2 | <0.27 |
| A5C220072-004 | FMSONSBG4/6-12" | BG-2 (DUP) (Background Sample) | 3/20/95 | <1.0 | 12.0 | | <0.50 | <1.0 | 7.3 | | 6.9 | | 3.7 | | 7.4 | | <30.0 | 8.2 | | 23.4 | | 3 | | 9.8 | | <0.10 | <0.50 | <1.0 | <100 | 0 | | 91.8 | <0.27 |
| A5C220072-003 | FMSONSBG3/10-16" | BG-3 (Background Sample) | 3/20/95 | <1.0 | 16.8 | | <0.50 | <1.0 | 9.5 | | 9.4 | | 6.4 | | 5.2 | | <30.0 | 12.7 | | 21.5 | | 3.4 | | 6.6 | | <0.10 | <0.50 | <1.0 | <100 | 29 | | 84.6 | <0.30 |
| A5C220072-005 | FMGWMWC | EQUIPMENT BLANK | 3/20/95 | <10.0 | <10.0 | | <5.0 | <10.0 | <50.0 | | <20.0 | | <10.0 | | <40.0 | | <300 | <50.0 | | <50.0 | | <5.0 | | <5.0 | | <0.20 | <5.0 | <10.0 | <1,000 | <1.2 | | 81.8 | <0.005 |
| A5D200054-001 | FMSONS10/4-6' | SB-10 | 4/18/95 | <1.0 | 32.9 | | 0.6 | 7.5 | <5.0 | | 6.3 | | 1,780 | | 220 | | 58.2 | 7.9 | | 2,590 | | 14.2 | | 1,540 | | <0.50 | 1 | <1.0 | 189 | <24 | | 81.8 | <0.31 |
| A5D200054-002 | FMSONS53/4-6' | SB-10 (DUP) | 4/18/95 | 4 | 191 | | 0.7 | 40.5 | 6.5 | | 15.4 | | 2,650 | | 414 | | 351 | 9.6 | | 4,630 | | 53.1 | | 10,600 | | 0.66 | 2.3 | <1.0 | 1,120 | <26 | | 76.7 | <0.33 |
| A5D200054-003 | FMGWMWE | EQUIPMENT BLANK | 4/18/95 | <10.0 | <10.0 | | <5.0 | <10.0 | <50.0 | | <20.0 | | 36.0 | | <40.0 | | <300 | <50.0 | | 86.0 | | <5.0 | | 40.8 | | <0.20 | <5.0 | <10.0 | <1,000 | <1.2 | | | <0.005 |
| A5D200054-004 | FMSONS17/3-5' | SB-17 | 4/18/95 | <.1.0 | 4.6 | | <0.50 | <1.0 | 5.1 | | 5.2 | | 20.1 | | 6.4 | | <30.0 | 5.4 | | 35.9 | | 3.4 | | 7.8 | | <0.50 | <0.50 | <1.0 | <100 | <26 | | 78.1 | <0.32 |
| A5D200054-005 | FMSONS23/1-3' | SB-23 | 4/18/95 | 7.7 | 402 | | 6.9 | 118 | 13.0 | | 45.9 | | 8,830 | | 474 | | 6,560 | 13.9 | | 17,100 | | 189 | | 30,300 | | 2.9 | 6.1 | 1.1 | 4,670 | <24 | | 83.6 | <0.30 |
| A5D200054-006 | FMSONS20/3-5' | SB-20 | 4/18/95 | <1.0 | 56.1 | | 1.1 | 2.6 | <5.0 | | 113.0 | | 505 | | 35.2 | | 36.2 | 32.7 | | 987 | | 7.5 | | 881 | | <0.50 | <0.50 | <1.0 | 152 | <24 | | 83.9 | <0.30 |
| A5D200054-007 | FMGWMWF | EQUPMENT BLANK | 4/18/95 | <10.0 | <10.0 | | <5.0 | <10.0 | <50.0 | | <20.0 | | 17.0 | | <40.0 | | <300 | <50.0 | | <50.0 | | <5.0 | | 18.2 | | #### | <5.0 | <10.0 | <1,000 | <1.2 | | | <0.005 |
| A5D200054-008 | FMSONS24/1-3' | SB-24 | 4/18/95 | <1.0 | 4.6 | | <0.50 | <1.0 | <5.0 | | 3.6 | | 13.6 | | <4.0 | | <30.0 | <5.0 | | 40.1 | | 1.4+ | * | 9.8 | | <0.50 | <0.50 | <1.0 | <100 | <24 | | 85.1 | <0.29 |
| A5D200054-009 | FMSONS36/1-3' | SB-36 | 4/18/95 | <1.0 | 14.8 | | <0.50 | <1.0 | 11.7 | | 43.0 | | 42.5 | | 25.0 | | <30.0 | 10.6 | | 146 | | 9.5 | | 56.1 | | <0.50 | <1.0 | <1.0 | <100 | <22 | | 91.0 | <0.27 |
| A5D200054-010 | FMSONS35/1-3' | SB-35 | 4/18/95 | <1.0 | 5.3 | | <0.50 | <1.0 | <5.0 | | 6.6 | | 25.8 | | 6.1 | | <30.0 | 10.2 | | 34.9 | | 2 | | 6.4 | | <0.50 | <0.50 | <1.0 | <100 | <24 | | 84.4 | <0.30 |
| A5D200054-011 | FMSONS31/1-3' | SB-31 | 4/18/95 | <1.0 | 12.6 | | <0.50 | <1.0 | 12.8 | | 27.6 | | 19.4 | | 18.5 | | <30.0 | 10.4 | | 46.3 | | 3.7 | | 25.5 | | <0.50 | <0.50 | <1.0 | <100 | <23 | | 86.5 | <0.29 |
| A5D200054-012 | FMSONS54/3-5' | SB-20 (DUP) | 4/18/95 | <1.0 | 16.6 | | <0.50 | <1.0 | <5.0 | | 11.7 | | 177 | | 12.2 | | <30.0 | 8 | | 267 | | 4.2 | | 333 | | <0.50 | <0.50 | <1.0 | <100 | <26 | | 77.9 | <0.32 |
| A5D200054-013 | FMGWMWG | EQUIPMENT BLANK | 4/18/95 | <10.0 | <10.0 | | <5.0 | <10.0 | <50.0 | | <20.0 | | <10.0 | | <40.0 | | <300 | <50.0 | | <50.0 | | <5.0 | | 18.1 | | <0.20 | <5.0 | <10.0 | <1,000 | <1.2 | | | <0.005 |
| A5D200054-014 | FMSOSB8/5-7' (MS/MSD) | SB-8 | 4/19/95 | <1.0 | 19.2 | | <0.50 | <1.0 | <5.0 | | 5.6 | | 462 | | 13.7 | | <30.0 | 7.5 | | 569 | | 3.9 | | 220 * | | <0.50 | <0.50 | <1.0 | <100 | <25 | | 79.3 | <0.32 |
| A5D200054-015 | FMSOSB8/7-8' (MS/MSD) | SB-8 | 4/19/95 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 77.6 | |
| A5D200054-016 | FMEFF | WOTP PVC DRAIN PIPE EFFLUENT | 4/19/95 | <10.0 | 17.0 | | <5.0 | <10.0 | <50.0 | | <20.0 | | <10.0 | | <40.0 | | <300 | <50.0 | | 489 | | <5.0 | | 73.5 | | <0.20 | <5.0 | <10.0 | <1,000 | <1.2 | | | <0.005 |
| A5D200054-017 | FMSOSB9/4-6' | SB-9 | 4/19/95 | <1.0 | 20.4 | | <0.50 | 1.6 | <5.0 | | 5.5 | | 638 | | 13.9 | | <30.0 | 7.9 | | 876 | | 3.4 | | 366 | | <0.50 | <0.50 | <1.0 | <100 | <25 | | 79.7 | <0.31 |
| A5D200054-018 | FMSOSB55/4-6' | SB-9 (DUP) | 4/19/95 | <1.0 | 24.0 | | 0.5 | 1.5 | <5.0 | | 7.5 | | 803 | | 23.3 | | <30.0 | 8.4 | | 1,010 | | 3.5 | | 388 | | <0.50 | <0.50 | <1.0 | 107 | <25 | | 82.1 | <0.30 |
| A5D200054-019 | FMSOSB7/5-7' | SB-7 | 4/19/95 | <1.0 | 5.5 | | <0.50 | <1.0 | <5.0 | | 4.8 | | 151 | | 5 | | <30.0 | 7.8 | | 149 | | 1.6 | | 40.2 | | <0.50 | <0.50 | <1.0 | <100 | <25 | | 78.9 | <0.32 |
| A5D200054-020 | FMSOSB6/5-7' | SB-6 | 4/19/95 | <1.0 | 52 | | <0.50 | 34.5 | <5.0 | | 7.5 | | 2,310 | | 39.6 | | <30.0 | 11.4 | | 2,440 | | 5.1 | | 974 | | <0.50 | <0.50 | <1.0 | 285 | <25 | | 78.9 | <0.32 |
| A5D200054-021 | FMGWMWH | EQUIPMENT BLANK | 4/19/95 | <1.0 | <10.0 | | <5.0 | <10.0 | <50.0 | | <20.0 | | <10.0 | | <40.0 | | <300 | <50.0 | | 198 | | <5.0 | | 8 | | <0.20 | <5.0 | <10.0 | <1,000 | <1.2 | | | <0.005 |
| A5D200054-022 | FMSOSB6/1-3' | SB-6 | 4/19/95 | 1.1 | 113 | | <0.50 | 28.4 | 6.7 | | 12.7 | | 5,150 | | 65.3 | | 33.4 | 12.2 | | 6,510 | | 11.4 | | 2,020 | | 1.2 | <0.50 | <1.0 | 572 | <24 | | 81.8 | <0.31 |
| | | Average Background Level | | | 12.7 | | | | 10.4 | | 12.2 | | 4.5 | | 7.5 | | | 9.3 | | 23.5 | | 2.9 | | 7.9 | | | | | | 26.8 | 26.8 | 89.6 | |
| | | Standard Error | | | 3.181 | 3.2 | | | 2.884 | | 7.14 | | 1.3491 | 1.349 | 2.773 | 2.773 | | 2.371 | | 2.1142 | | 0.45 | | 1.6882 | | | | | | 15.9236 | 19.1 | 4.25 | |
| | | 95% Upper Confidence Limit | | | 16.47 | | | | 13.82 | | 20.55 | | 6.0872 | | 10.74 | | | 12.09 | | 25.937 | | 3.43 | | 9.8862 | | | | | | 45.4842 | 49.2 | 94.6 | |

NOTES:
J - ESTIMATED VALUE. (DETECTED), BUT BELOW QUANTITATION LIMIT.
B - (COMPOUND DETECTED IN METHOD BLANK ASSOCIATED WITH THIS SAMPLE)
S - SAMPLE RESULT DETERMINED BY THE METHOD OF STANDARD ADDITIONS
HASB - HAND-AUGERED SOIL BORING
SB - SOIL BORING
- Water samples, measured in ug/L

Table 4-2. Soil Analytical Results, Background Near Surface soil Sampling, Federated Metals, Hammond, Indiana.

**PARAMETERS**
**VOLATILES**
Results in ug/kg

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Acetone | Acetonitrile | Acrolein | Acrylonitrile | Allyl Chloride | 3-Chloro-1-propene | Benzene | Bromodichloromethane | Bromoform | Bromomethane | Methyl ethyl ketone | Carbon disulfide | Carbon Tetrachloride | Chlorobenzene | Chloroethane | Chloroform | Chloromethane | Chloroprene | Dibromochloromethane | 1,2-Dibromo-3-chloro-propane | 1,2-Dibromoethane | Dibromomethane | 2-Chloro-1,3-butadiene | Chlorodibromomethane | trans-1,4-Dichloro-2-butene | Dichlorodifluoromethane | 1,1-Dichloroethane | 1,2-Dichloroethane | 1,1-Dichloroethene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5C220072-001 | FMSONSBG1/12-18" (MS/MSD) | BG-1 (Background Sample) | 3/20/95 | <57 J | <57 R | <57 R | <57 | <5.7 | NA | <5.7 | <5.7 | <5.7 | <11 | <57 | <5.7 | <5.7 | <5.7 | <11 | <5.7 | <11 J | <5.7 | NA | <11 | <5.7 | <5.7 | <5.7 | <5.7 | <5.7 | <11 J | <5.7 | <5.7 | <5.7 |
| A5C220072-002 | FMSONSBG2/6-12" | BG-2 (Background Sample) | 3/20/95 | ND J | <53 R | <53 R | <53 | <5.3 | NA | <5.3 | <5.3 | <5.3 | <11 | 2.2 J | <5.3 | <5.3 | <5.3 | <11 | <5.3 | <11 J | <5.3 | NA | <11 | <5.3 | <5.3 | <5.3 | <5.3 | <5.3 | <11 J | <5.3 | <5.3 | <5.3 |
| A5C220072-004 | FMSONSBG4/6-12" | BG-2 (DUP) (Background Sample) | 3/20/95 | ND J | <54 R | <54 R | <54 | <5.4 | NA | <5.4 | <5.4 | <5.4 | <11 | <54 | <5.4 | <5.4 | <5.4 | <11 | <5.4 | <11 J | <5.4 | NA | <11 | <5.4 | <5.4 | <5.4 | <5.4 | <5.4 | <11 J | <5.4 | <5.4 | <5.4 |
| A5C220072-003 | FMSONSBG3/10-16" | BG-3 (Background Sample) | 3/20/95 | ND J | <59 R | <59 R | <59 | <5.9 | NA | <5.9 | <5.9 | <5.9 | <12 | <59 | <5.9 | <5.9 | <5.9 | <12 | <5.9 | <12 J | <5.9 | NA | <12 | <5.9 | <5.9 | <5.9 | <5.9 | <5.9 | <12 J | <5.9 | <5.9 | <5.9 |
| A5C220072-005 | FMGWMWC | EQUIPMENT BLANK | 3/20/95 | 16 J | <50 | <50 R | <50 | NA | <5.0 | <5.0 | <5.0 | <5.0 | <10 | <50 | <5.0 | <5.0 | <5.0 | <10 | <5.0 | <10 | <5.0 | NA | <10 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 J | <10 | <5.0 | <5.0 | <5.0 |

**PARAMETERS**
**VOLATILES (Continued)**
Results in ug/kg

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | 1,2-Dichloroethene, Total | 1,2-Dichloropropane | cis-1,3-Dichloropropene | trans-1,3-Dichloropropene | 1,4-Dioxane | Ethylbenzene | Ethyl methacrylate | 2-Hexanone | Iodomethane | Isobutyl alcohol | Methacrylonitrile | Methylene chloride | Methyl methacrylate | 4-Methyl-2-pentanone | Propionitrile | Styrene | 1,1,1,2-Tetrachloroethane | 1,1,2,2-Tetrachloroethane | Tetrachloroethene | Toluene | 1,1,1-Trichloroethane | 1,1,2-Trichloroethane | Trichloroethene | Trichlorofluoromethane | 1,2,3-Trichloropropane | Vinyl acetate | Vinyl chloride | Xylenes, Total | Methyl Iodide |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5C220072-001 | FMSONSBG1/12-18" (MS/MSD) | BG-1 (Background Sample) | 3/20/95 | <5.7 | <5.7 | <5.7 | <5.7 | <1,100 R | <5.7 | <5.7 | <57 | NA | <570 R | <23 | <5.7 | <5.7 | <57 | <23 | <5.7 | <5.7 | <5.7 | <5.7 | <5.7 | <5.7 | <5.7 | <5.7 | <5.7 | <57 | <11 | <5.7 | <11 |
| A5C220072-002 | FMSONSBG2/6-12" | BG-2 (Background Sample) | 3/20/95 | <5.3 | <5.3 | <5.3 | <5.3 | <1,100 R | <5.3 | <5.3 | <53 | NA | <530 R | <21 | <5.3 | <5.3 | <53 | <21 | <5.3 | <5.3 | <5.3 | <5.3 | <5.3 | <5.3 | <5.3 | <5.3 | <5.3 | <53 | <11 | <5.3 | <11 |
| A5C220072-004 | FMSONSBG4/6-12" | BG-2 (DUP) (Background Sample) | 3/20/95 | <5.4 | <5.4 | <5.4 | <5.4 | <1,100 R | <5.4 | <5.4 | <54 | NA | <540 R | <22 | <5.4 | <5.4 | <54 | <22 | <5.4 | <5.4 | <5.4 | <5.4 | <5.4 | <5.4 | <5.4 | <5.4 | <5.4 | <54 | <11 | <5.4 | <11 |
| A5C220072-003 | FMSONSBG3/10-16" | BG-3 (Background Sample) | 3/20/95 | <5.9 | <5.9 | <5.9 | <5.9 | <1,200 R | <5.9 | <5.9 | <59 | NA | <590 R | <24 | <5.9 | <5.9 | <59 | <24 | <5.9 | <5.9 | <5.9 | <5.9 | <5.9 | <5.9 | <5.9 | <5.9 | <5.9 | <59 | <12 | <5.9 | <12 |
| A5C220072-005 | FMGWMWC | EQUIPMENT BLANK | 3/20/95 | <5.0 | <5.0 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <10 | <500 R | <20 | <5.0 | <5.0 | <50 | <20 R | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <10 |

NOTES:
NA - NOT ANALYZED.
B - (COMPOUND DETECTED IN METHOD BLANK ASSOCIATED WITH THIS SAMPLE)
MS/MSD - MATRIX SPIKE/MATRIX SPIKE DUPLICATE
+ - SAMPLE RESULTS DETERMINED BY THE METHOD OF STANDARD ADDITIONS AND THE CORRELATION COEFFICIENT WAS LESS THAN 0.995.
W - POST DIGESTION SPIKE FELL BETWEEN 40-85% WHILE THE SAMPLE RESULT WAS LESS THAN ONE-HALF THE REPORTING LIMIT.

S - SAMPLE RESULT DETERMINED BY THE METHOD OF STANDARD ADDITIONS.
HASB - HAND-AUGERED SOIL BORING
SB - SOIL BORING
- EQUIPMENT BLANK
- WATER SAMPLES, MEASURED IN ug/L.

J - ESTIMATED VALUE
UJ - ESTIMATED VALUE ( NOT DETECTED).
R - UNUSABLE (NOT DETECTED).
U - NOT DETECTED.



GERAGHTY & MILLER, INC.

Table 4-2. Soil Analytical Results, Background Near Surface soil Sampling, Federated Metals, Hammond, Indiana.

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | PARAMETER Semi-Volatiles: Acenapthene | Acenaphthylene | Acetophenone | 2-Acetylaminofluorene | 4-Aminobiphenyl | Aniline | Anthracene | Aramite, Total | Benzo (a) anthracene | Benzo (b) fluoranthene | Benzo (k) fluoranthene | Benzo (g,h,i) perylene | Benzo (a) pyrene | Benzyl alcohol | bis(2-Chloroisopropyl)ether | bis(2-Ethylhexyl)phthalate | 4-Bromophenyl phenyl ether | Butyl benzyl phthalate | 2-sec-Butyl-4,6-dinitro-phenol | 4-Chloroaniline | p-Chlorobenzilate | bis (2-Chloroethoxy) methane | bis(2-Chloroethyl)ether | bis(2-Chloro-1-methylethyl) ether | 4-Chloro-3-methylphenol | 2-Chloronaphthalene | 2-Chlorophenol | 4-Chlorophenyl phenyl ether | Chrysene | Dialiate | Dibenz(a,h)anthracene | Dibenzofuran |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5C220072-001 | FMSONSBG1/12-18" (MS/MSD) | BG-1 (Background Sample) | 3/20/95 | <380 | <380 | <380 | <750 | <1,800 | <380 | <380 | NA | <380 | <380 | <380 J | <380 J | <380 J | <380 | <380 | <380 | <380 | <380 | <380 | NA | <380 | <380 | <380 | <380 | NA | <380 | <380 | <380 | <380 | <380 | <380 J | <380 J | <380 |
| A5C220072-002 | FMSONSBG2/6-12" | BG-2 (Background Sample) | 3/20/95 | <350 | <350 | <350 | <700 | <1700 | <350 | <350 | NA | <350 | <350 | <350 J | <350 J | <350 J | <350 | <350 | <350 | <350 | <350 | <350 | NA | <350 | <350 | <350 | <350 | NA | <350 | <350 | <350 | <350 | <350 | <350 J | <350 J | <350 |
| A5C220072-004 | FMSONSBG4/6-12" | BG-2 (DUP) (Background Sample) | 3/20/95 | <360 | <360 | <360 | <720 | <1700 | <360 | <360 | NA | <360 | <360 | <360 J | <360 J | <360 J | <360 | <360 | <360 | <360 | <360 | <360 | NA | <360 | <360 | <360 | <360 | NA | <360 | <360 | <360 | <360 | <360 | <360 J | <360 J | <360 |
| A5C220072-003 | FMSONSBG3/10-16" | BG-3 (Background Sample) | 3/20/95 | <390 | <390 | <390 | <780 | <1,900 | <390 | <390 | NA | <390 | <390 | <390 J | <390 J | <390 J | <390 | <390 | <390 | <390 | <390 | <390 | NA | <390 | <390 | <390 | <390 | NA | <390 | <390 | <390 | <390 | <390 | <390 J | <390 J | <390 |
| A5C220072-005 | FMGWMWC | EQUIPMENT BLANK | 3/20/95 | <10 | <10 | <10 | <20 | <50 | <10 | <10 | NA | <10 | <10 | <10 J | <10 J | <10 J | <10 | <10 | <10 | <10 | <10 | <10 | NA | <10 | <10 | <10 | <10 | NA | <10 | <10 | <10 | <10 | <10 | <10 | <10 J | <10 |

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | PARAMETER Semi-Volatiles (Continued): Di-n-butyl phthalate | 1,2-Dichlorobenzene | 1,3-Dichlorobenzene | 1,4-Dichlorobenzene | 3,3'-Dichlorobenzidine | 2,4-Dichlorophenol | 2,6-Dichlorophenol | Diethyl phthalate | Dimethoate | p-(Dimethylamino)azobenzene | Disulfoton | 7,12-Dimethylbenz(a)-anthracene | 3,3'-Dimethylbenzidine | a,a-Dimethylphenethylamine | 2,4-Dimethylphenol | alpha,alpha-Dimethyl phenethyl | Dimethyl phthalate | 1,3-Dinitrobenzene | 4,6-Dinitro-2-methylphenol | 2,4-Dinitrophenol | 2,4-Dinitrotoluene | 2,6-Dinitrotoluene | Di-n-octyl phthalate | Diphenylamine | bis(2-Ethylhexyl) phthalate | Ethyl methanesulfonate | Famphur | Fluoranthene | Fluorene | Hexachlorobenzene | Hexachlorobutadiene | Hexachlorocyclopentadiene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5C220072-001 | FMSONSBG1/12-18" (MS/MSD) | BG-1 (Background Sample) | 3/20/95 | <380 | <380 | <380 | <380 | <750 | <380 | <380 | <380 | <7,500 | <750 | NA | <3,800 J | <1,800 | <1,800 J | <380 | <1,800 | <380 | <380 | <1,800 | <1,800 | <380 | <380 | <380 | <380 | NA | <380 | <380 | <380 | <380 | <380 | <380 | <380 |
| A5C220072-002 | FMSONSBG2/6-12" | BG-2 (Background Sample) | 3/20/95 | <350 | <350 | <350 | <350 | <700 | <350 | <350 | <350 | <7,000 | <700 | NA | <3,500 J | <1,700 | <1700 J | <350 | <1,700 | <350 | <350 | <1,700 | <1,700 | <350 | <350 | <350 | <350 | NA | <350 | NA | <350 | <350 | <350 | <350 | <350 |
| A5C220072-004 | FMSONSBG4/6-12" | BG-2 (DUP) (Background Sample) | 3/20/95 | <360 | <360 | <360 | <360 | <720 | <360 | <360 | <360 | <7,200 | <720 | NA | <3,600 J | <1,700 | <1700 J | <360 | <1,700 | <360 | <360 | <1,700 | <1,700 | <360 | <360 | <360 | <360 | NA | <360 | NA | <360 | <360 | <360 | <360 | <360 |
| A5C220072-003 | FMSONSBG3/10-16" | BG-3 (Background Sample) | 3/20/95 | <390 | <390 | <390 | <390 | <780 | <390 | <390 | <390 | <7,800 | <780 | NA | <3,900 J | <1,900 | <1900 J | <390 | <1,900 | <390 | <390 | <1,900 | <1,900 | <390 | <390 | <390 | <390 | NA | <390 | NA | <390 | <390 | <390 | <390 | <390 |
| A5C220072-005 | FMGWMWC | EQUIPMENT BLANK | 3/20/95 | <10 | <10 | <10 | <10 | <20 | <10 | <10 | <10 | <200 | <20 | <10 | <100 J | <50 | <50 J | <10 | <50 | <10 | <10 | <50 | <50 | <10 | <10 | <10 | <10 | NA | <10 | <100 | <10 | <10 | <10 | <10 | <10 |

NOTES:

NA - NOT ANALYZED.

B - (COMPOUND DETECTED IN METHOD BLANK ASSOCIATED WITH THIS SAMPLE)

MS/MSD - MATRIX SPIKE/MATRIX SPIKE DUPLICATE

+ - SAMPLE RESULTS DETERMINED BY THE METHOD OF STANDARD ADDITIONS AND THE CORRELATION COEFFICIENT WAS LESS THAN 0.995.

W - POST DIGESTION SPIKE FELL BETWEEN 40-85% WHILE THE SAMPLE RESULT WAS LESS THAN ONE-HALF THE REPORTING LIMIT.

S - SAMPLE RESULT DETERMINED BY THE METHOD OF STANDARD ADDITIONS.

HASB - HAND-AUGERED SOIL BORING

SB - SOIL BORING

- EQUIPMENT BLANK

- WATER SAMPLES, MEASURED IN ug/L.

J - ESTIMATED VALUE

UJ - ESTIMATED VALUE ( NOT DETECTED).

R - UNUSABLE (NOT DETECTED).

U - NOT DETECTED.

GERAGHTY & MILLER, INC.

Table 4-2. Soil Analytical Results, Background Near Surface soil Sampling, Federated Metals, Hammond, Indiana.

PARAMETER
Semi-Volatiles (Continued)

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Hexachloroethane | Hexachlorophene | Hexachloropropene | Indeno(1,2,3-cd)pyrene | Isophorone | Isosafrole, Total | Methapyrilene | 3-Methylcholanthrene | Methyl methanesulfonate | 2-Methylnaphthalene | Naphthalene | 1,4-Naphthoquinone | 1-Naphthylamine | 2-Naphthylamine | 2-Nitroaniline | 3-Nitroaniline | 4-Nitroaniline | Nitrobenzene | 4-Nitroquinoline-1-oxide | N-Nitrosodi-n-butylamine | N-Nitrosodiethylamine | N-Nitrosodimethylamine | N-Nitrosodiphenylamine | N-Nitrosodi-n-propylamine | N-Nitrosomethylethylamine | N-Nitrosomorpholine | N-Nitrosopiperidine | N-Nitrosopyrrolidine | 5-Nitro-o-toluidine | Pentachlorobenzene | Pentachloroethane |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5C220072-001 | FMSONSBG1/12-18* (MS/MSD) | BG-1 (Background Sample) | 3/20/95 | <380 | NA | <3,800 | <380 J | <380 | <380 | <3,800 | <1,700 | <380 | <380 | <380 | <7,500 | <380 | <380 | <1,800 | <1,800 | <1,800 | <380 | <3,800 | <380 | <380 | <380 | <380 | <380 | <380 | <380 | <380 | <380 | <380 | <380 | <1,800 |
| A5C220072-002 | FMSONSBG2/6-12* | BG-2 (Background Sample) | 3/20/95 | <350 | NA | <3,500 | <350 J | <350 | <350 | <3,500 | <1,600 | <350 | <350 | <350 | <7,000 | <350 | <350 | <1,700 | <1,700 | <1,700 | <350 | <3,500 | <350 | <350 | <350 | <350 | <350 | <350 | <350 | <350 | <350 | <350 | <350 | <1,700 |
| A5C220072-004 | FMSONSBG4/6-12* | BG-2 (DUP) (Background Sample) | 3/20/95 | <360 | NA | <3,600 | <360 J | <360 | <360 | <3,600 | <1,600 | <360 | <360 | <360 | <7,200 | <360 | <360 | <1,700 | <1,700 | <1,700 | <360 | <3,600 | <360 | <360 | <360 | <360 | <360 | <360 | <360 | <360 | <360 | <360 | <360 | <1,700 |
| A5C220072-003 | FMSONSBG3/10-16* | BG-3 (Background Sample) | 3/20/95 | <390 | NA | <3,900 | <390 J | <390 | <390 | <3,900 | <1,800 | <390 | <390 | <390 | <7,800 | <390 | <390 | <1,900 | <1,900 | <1,900 | <390 | <3,900 | <390 | <390 | <390 | <390 | <390 | <390 | <390 | <390 | <390 | <390 | <390 | <1,900 |
| A5C220072-005 | FMGWMWC | EQUIPMENT BLANK | 3/20/95 | <10 | NA | <100 | <10 J | <10 | <10 | <100 | <100 | <10 | <10 | <10 | <200 | <10 | <10 | <50 | <50 | <50 | <10 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <50 |

PARAMETER
Semi-Volatiles (Continued)

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Pentachloronitrobenzene | Phenacetin | Phenanthrene | p-Phenylene diamine | Phorate | 2-Picoline | Pronamide | Pyrene | Pyridine | Safrole, Total | 1,2,4,5-Tetrachlorobenzene | Tetraethyldithiopyro-phosphate | o-Toluidine | 1,2,4-Trichlorobenzene | O,O,O-Triethyl phosphoro-thioate | 1,3,5-Trinitrobenzene | o-Cresol | m-Cresol | p-Cresol | 2-Methylphenol | 3-Methylphenol | 4-Methylphenol | Dinoseb | 2-Nitrophenol | 4-Nitrophenol | Pentachlorophenol | Phenol | 2,3,4,6-Tetrachlorophenol | Thionazin | 2,4,5-Trichlorophenol | 2,4,6-Trichlorophenol |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5C220072-001 | FMSONSBG1/12-18* (MS/MSD) | BG-1 (Background Sample) | 3/20/95 | <1,800 | <1,800 | <380 | <1,800 J | NA | <750 | <750 | <380 | <380 | <380 | <380 | <1,800 | <380 | <380 | <1,800 | <1,800 | NA | NA | NA | <380 | <380 | <380 | NA | <380 | <1,800 | <1,800 | <380 | <1,800 | NA | <380 | <380 |
| A5C220072-002 | FMSONSBG2/6-12* | BG-2 (Background Sample) | 3/20/95 | <1,700 | <1,700 | <350 | <1,700 J | NA | <700 | <700 | <350 | <350 | <350 | <350 | <1,700 | <350 | <350 | <1,700 | <1,700 | NA | NA | NA | <350 | <350 | <350 | NA | <350 | <1,700 | <1,700 | <350 | <1,700 | NA | <350 | <350 |
| A5C220072-004 | FMSONSBG4/6-12* | BG-2 (DUP) (Background Sample) | 3/20/95 | <1,700 | <1,700 | <360 | <1,700 J | NA | <720 | <720 | <360 | <360 | <360 | <360 | <1,700 | <360 | <360 | <1,700 | <1,700 | NA | NA | NA | <360 | <360 | <360 | NA | <360 | <1,700 | <1,700 | <360 | <1,700 | NA | <360 | <360 |
| A5C220072-003 | FMSONSBG3/10-16* | BG-3 (Background Sample) | 3/20/95 | <1,900 | <1,900 | <390 | <1,900 J | NA | <780 | <780 | <390 | <390 | <390 | <390 | <1,900 | <390 | <390 | <1,900 | <1,900 | NA | NA | NA | <390 | <390 | <390 | NA | <390 | <1,900 | <1,900 | <390 | <1,900 | NA | <390 | <390 |
| A5C220072-005 | FMGWMWC | EQUIPMENT BLANK | 3/20/95 | <50 | <50 | <10 | <50 J | <50 | <20 | <20 | <10 | <10 | <10 | <10 | <50 | <10 | <10 | <50 | <50 | NA | NA | NA | <10 | <10 | <10 | <50 | <10 | <50 | <50 | <10 | <50 | NA | <10 | <10 |

NOTES:
NA - NOT ANALYZED.
B - (COMPOUND DETECTED IN METHOD BLANK ASSOCIATED WITH THIS SAMPLE)
MS/MSD - MATRIX SPIKE/MATRIX SPIKE DUPLICATE
+ - SAMPLE RESULTS DETERMINED BY THE METHOD OF STANDARD ADDITIONS AND THE CORRELATION COEFFICIENT WAS LESS THAN 0.995.
W - POST DIGESTION SPIKE FELL BETWEEN 40-85% WHILE THE SAMPLE RESULT WAS LESS THAN ONE-HALF THE REPORTING LIMIT.
S - SAMPLE RESULT DETERMINED BY THE METHOD OF STANDARD ADDITIONS.
HASB - HAND-AUGERED SOIL BORING
SB - SOIL BORING
- EQUIPMENT BLANK
- WATER SAMPLES, MEASURED IN ug/L.
J - ESTIMATED VALUE
UJ - ESTIMATED VALUE ( NOT DETECTED).
R - UNUSABLE (NOT DETECTED).
U - NOT DETECTED.



GERAGHTY & MILLER, INC.

Table 4-2. Soil Analytical Results, Background Near Surface soil Sampling, Federated Metals, Hammond, Indiana.

| | | | | PARAMETER Metals Results in mg/kg | | | | | | | | | | | | | | | | PARAMETER Fluoride, Total Solids, Total Cyanide, Results in mg/kg | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Silver | Barium | Beryllium | Cadmium | Cobalt | Chromium | Copper | Nickel | Antimony | Vanadium | Zinc | Arsenic | Lead | Mercury | Selenium | Thallium | Tin | Fluoride | Solids, Total(TS) | Cyanide, Total |
| A5C220072-001 | FMSONSBG1/12-18" (MS/MSD) | BG-1 (Background Sample) | 3/20/95 | <1.0 | 9.1 | <0.50 | <1.0 | 10.7 | 9.6 | 3.4 | 5.9 | <30.0 J | 7.3 | 22.5 | 2.9 | 6.4 | <0.10 | W <0.50 J | W <1.0 J | <100 | 33 J | 87.8 | <0.28 J |
| A5C220072-002 | FMSONSBG2/6-12" | BG-2 (Background Sample) | 3/20/95 | <1.0 | 13.0 | <0.50 | <1.0 | 14.2 | 22.7 | 4.5 | 11.4 | <30.0 J | 9 | 26.4 | 2.3 J | 8.8 | <0.10 | W <0.50 J | <1.0 J | <100 | 45 J | 94.2 | <0.27 J |
| A5C220072-004 | FMSONSBG4/6-12" | BG-2 (DUP) (Background Sample) | 3/20/95 | <1.0 | 12.0 | <0.50 | <1.0 | 7.3 | 6.9 | 3.7 | 7.4 | <30.0 J | 8.2 | 23.4 | 3 | 9.8 | <0.10 | W <0.50 J | <1.0 | <100 | <22 J | 91.8 | <0.27 J |
| A5C220072-003 | FMSONSBG3/10-16" | BG-3 (Background Sample) | 3/20/95 | <1.0 | 16.8 | <0.50 | <1.0 | 9.5 | 9.4 | 6.4 | 5.2 | <30.0 J | 12.7 | 21.5 | 3.4 | 6.6 | <0.10 | W <0.50 J | <1.0 | <100 | 29 J | 84.6 | <0.30 J |
| A5C220072-005 | FMGWMWC | EQUIPMENT BLANK | 3/20/95 | <10.0 | <10.0 | <5.0 | <10.0 | <50.0 | <20.0 | <10.0 | <40.0 | <300 | <50.0 | <50.0 | <5.0 | <3.0 | <0.20 | W <5.0 J | <10.0 | <1,000 | <1.2 | NA | <0.005 J |

NOTES:

NA - NOT ANALYZED.
B - (COMPOUND DETECTED IN METHOD BLANK ASSOCIATED WITH THIS SAMPLE)
MS/MSD - MATRIX SPIKE/MATRIX SPIKE DUPLICATE
+ - SAMPLE RESULTS DETERMINED BY THE METHOD OF STANDARD ADDITIONS AND THE CORRELATION COEFFICIENT WAS LESS THAN 0.995.
W - POST DIGESTION SPIKE FELL BETWEEN 40-85% WHILE THE SAMPLE RESULT WAS LESS THAN ONE-HALF THE REPORTING LIMIT.
S - SAMPLE RESULT DETERMINED BY THE METHOD OF STANDARD ADDITIONS.

HASB - HAND-AUGERED SOIL BORING
SB - SOIL BORING
- EQUIPMENT BLANK
- WATER SAMPLES, MEASURED IN ug/L.
J - ESTIMATED VALUE
UJ - ESTIMATED VALUE ( NOT DETECTED).

R - UNUSABLE (NOT DETECTED).
U - NOT DETECTED.

Table 4-3. Soil Sample Analytical Results, SWMUs 1& 2, Near Surface Soil Sampling, Federated Metals, Hammond, Indiana.

| | | | | PARAMETER<br>Semi-Volatiles | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Acenapthene | Acenaphthylene | Acetophenone | 2-Acetylaminofluorene | 4-Aminobiphenyl | Aniline | Anthracene | Aramite, Total | Benzo (a) anthracene | Benzo (b) fluoranthene | Benzo (k) fluoranthene | Benzo (g,h,i) perylene | Benzo (a) pyrene | Benzyl alcohol | bis(2-Chloroisopropyl)ether | bis(2-Ethylhexyl)phthalate | 4-Bromophenyl phenyl ether | Butyl benzyl phthalate | 2-sec-Butyl-4,6-dinitro-phenol | 4-Chloroaniline | p-Chlorobenzilate | bis (2-Chloroethoxy) methane | bis(2-Chloroethyl)ether | bis(2-Chloro-1-methylethyl) ether | 4-Chloro-3-methylphenol | 2-Chloronaphthalene | 2-Chlorophenol | 4-Chlorophenyl phenyl ether | Chrysene | Diallate | Dibenz(a,h)anthracene | Dibenzofuran |
| A5K290148-001 | FMSONS37/1.5-2' | NS37 | 11/20/95 | <370 | <370 | <370 | <740 | <1,800 | <370 | <370 | NA | <370 | <370 | <370 | <370 | <370 | <370 | NA | NA | <370 | <370 | <740 | <370 | <370 | <370 | <370 | <370 | <370 | <370 | <370 | <370 | <370 UJ | <370 | <370 |
| A5K290148-002 | FMSONS38/5-5.5' | NS38 | 11/20/95 | <410 | <410 | <410 | <820 | <2,000 | <410 | <410 | NA | <410 | <410 | <410 | <410 | <410 | <410 | NA | NA | <410 | <410 | <820 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 UJ | <410 | <410 |
| A5K290148-003 | FMSONS39/5-5.5' | NS39 | 11/20/95 | <430 | <430 | <430 | <860 | <2,100 | <430 | <430 | NA | <430 | <430 | <430 | <430 | <430 | <430 | NA | NA | <430 | <430 | <860 | <430 | <430 | <430 | <430 | <430 | <430 | <430 | <430 | <430 | <430 UJ | <430 | <430 |
| A5K290148-004 | FMSONS40/4-4.5' | NS40 | 11/21/95 | <400 | <400 | <400 | <800 | <1,900 | <400 | <400 | NA | <400 | <400 | <400 | <400 | <400 | <400 | NA | NA | <400 | <400 | <800 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 UJ | <400 | <400 |
| A5K290148-005 | FMSONS41/4-4.5' | NS41 | 11/21/95 | <400 | <400 | <400 | <800 | <1,900 | <400 | <400 | NA | <400 | <400 | <400 | <400 | <400 | <400 | NA | NA | <400 | <400 | <800 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 UJ | <400 | <400 |
| A5K290148-006 | FMSONS42/3.5-4' | NS42 | 11/21/95 | <430 | <430 | <430 | <850 | <2,100 | <430 | <430 | NA | <430 | <430 | <430 | <430 | <430 | <430 | NA | NA | <430 | <430 | <850 | <430 | <430 | <430 | <430 | <430 | <430 | <430 | <430 | <430 | <430 UJ | <430 | <430 |
| A5K290148-007 | FMSONS55/3.5-4' | NS42 (DUP) | 11/21/95 | <410 | <410 | <410 | <830 | <2,000 | <410 | <410 | NA | <410 | <410 | <410 | <410 | <410 | <410 | NA | NA | <410 | <410 | <830 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 UJ | <410 | <410 |
| A5K290148-008 | FMSONS43/1-1.5' | NS43 | 11/21/95 | <360 UJ | <360 UJ | <360 UJ | <730 UJ | <1,800 UJ | <360 UJ | <360 UJ | NA | <360 UJ | <360 UJ | <360 UJ | <360 UJ | <360 UJ | <360 UJ | NA | NA | <360 UJ | <360 UJ | <730 | <360 UJ | <360 UJ | <360 UJ | <360 UJ | <360 UJ | <360 UJ | <360 | <360 UJ | <360 | <360 UJ | <360U | <360 UJ | <360 UJ |
| A5K290148-009 | FMSONS44/6-6.5' | NS44 | 11/21/95 | <370 | <370 | <370 | <740 | <1,800 | <370 | <370 | NA | <370 | <370 | <370 | <370 | <370 | <370 | NA | NA | <370 | <370 | <740 | <370 | <370 | <370 | <370 | <370 | <370 | <370 | <370 | <370 | <370 UJ | <370 | <370 |
| A5K290148-010 | FMSONS45/9-9.5' | NS45 | 11/22/95 | <400 | <400 | <400 | <810 | <2,000 | <400 | <400 | NA | <400 | <400 | <400 | <400 | <400 | <400 | NA | NA | <400 | <400 | <810 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 UJ | <400 | <400 |
| A5K290148-011 | FMSONS46/6-6.5' (MS/MSD) | NS46 | 11/22/95 | <410 | <410 | <410 | <810 | <2,000 | <410 | <410 | NA | <410 | <410 | <410 | <410 | <410 | <410 | NA | NA | <410 | <410 | <810 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 UJ | <410 | <410 |
| A5K220162-001 | FMGWMWH | EQUIPMENT BLANK | 11/21/95 | <10 | <10 | <10 | <20 | <50 | <10 | <10 | NA | <10 | <10 | <10 | <10 | <10 | <10 | 4.45 | <10 | <10 | <10 | <20 | <10 | NA | <10 | <10 | <10 | <10 | <10 | <10 | <10 | NA | <10 | <10 |

| | | | | PARAMETER<br>Semi-Volatiles (Continued) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Di-n-butyl phthalate | 1,2-Dichlorobenzene | 1,3-Dichlorobenzene | 1,4-Dichlorobenzene | 3,3'-Dichlorobenzidine | 2,4-Dichlorophenol | 2,6-Dichlorophenol | Diethyl phthalate | Dimethoate | p-(Dimethylamino)azobenzene | Disulfoton | 7,12-Dimethylbenz(a)-anthracene | 3,3'-Dimethylbenzidine | a,a-Dimethylphenethylamine | 2,4-Dimethylphenol | alpha,alpha-Dimethyl phenethyl | Dimethyl phthalate | 1,3-Dinitrobenzene | 4,6-Dinitro-2-methylphenol | 2,4-Dinitrophenol | 2,4-Dinitrotoluene | 2,6-Dinitrotoluene | Di-n-octyl phthalate | Diphenylamine | bis(2-Ethylhexyl) phthalate | Ethyl methanesulfonate | Famphur | Fluoranthene | Fluorene | Hexachlorobenzene | Hexachlorobutadiene | Hexachlorocyclopentadiene |
| A5K290148-001 | FMSONS37/1.5-2' | NS37 | 11/20/95 | <370 | <370 | <370 | <370 | <740 | <370 | <370 | <370 | <7,400 UJ | <740 | <1,300 | <740 | <370 | <740 | <370 | NA | <370 | <740 | <1,800 | <1,800 | <370 | <370 | <370 | <370 | <370 | <370 | <3,700 UJ | <370 | <370 | <370 | <370 UJ | <370 UJ |
| A5K290148-002 | FMSONS38/5-5.5' | NS38 | 11/20/95 | <410 | <410 | <410 | <410 | <820 | <410 | <410 | <410 | <8,200 UJ | <820 | <2,000 | <820 | <410 | <820 | <410 | NA | <410 | <820 | <2,000 | <2,000 | <410 | <410 | <410 | <410 | <410 | <410 | <4,100 UJ | <410 | <410 | <410 | <410 UJ | <410 UJ |
| A5K290148-003 | FMSONS39/5-5.5' | NS39 | 11/20/95 | <430 | <430 | <430 | <430 | <860 | <430 | <430 | <430 | <8,600 UJ | <860 | <2,100 | <860 | <430 | <860 | <430 | NA | <430 | <860 | <2,100 | <2,100 | <430 | <430 | <430 | <430 | <430 | <430 | <4,300 UJ | <430 | <430 | <430 | <430 UJ | <430 UJ |
| A5K290148-004 | FMSONS40/4-4.5' | NS40 | 11/21/95 | <400 | <400 | <400 | <400 | <800 | <400 | <400 | <400 | <8,000 UJ | <800 | <1,900 | <800 | <400 | <800 | <400 | NA | <400 | <800 | <1,900 | <1,900 | <400 | <400 | <400 | <400 | <400 | <400 | <4,000 UJ | <400 | <400 | <400 | <400 UJ | <400 UJ |
| A5K290148-005 | FMSONS41/4-4.5' | NS41 | 11/21/95 | <400 | <400 | <400 | <400 | <800 | <400 | <400 | <400 | <8,000 UJ | <800 | <1,900 | <800 | <400 | <800 | <400 | NA | <400 | <800 | <1,900 | <1,900 | <400 | <400 | <400 | <400 | <400 | <400 | <4,000 UJ | <400 | <400 | <400 | <400 UJ | <400 UJ |
| A5K290148-006 | FMSONS42/3.5-4' | NS42 | 11/21/95 | <430 | <430 | <430 | <430 | <850 | <430 | <430 | <430 | <8,500 UJ | <850 | <2,100 | <850 | <430 | <850 | <430 | NA | <430 | <850 | <2,100 | <2,100 | <430 | <430 | <430 | <430 | <430 | <430 | <4,300 UJ | <430 | <430 | <430 | <430 UJ | <430 UJ |
| A5K290148-007 | FMSONS55/3.5-4' | NS42 (DUP) | 11/21/95 | <410 | <410 | <410 | <410 | <830 | <410 | <410 | <410 | <8,300 UJ | <830 | <2,000 | <830 | <410 | <830 | <410 | NA | <410 | <830 | <2,000 | <2,000 | <410 | <410 | 120 J | <410 | <410 | <410 | <4,100 UJ | <410 | <410 | <410 | <410 UJ | <410 UJ |
| A5K290148-008 | FMSONS43/1-1.5' | NS43 | 11/21/95 | <360 UJ | <360 UJ | <360 UJ | <360 UJ | <730 UJ | <360 | <360 | <360 UJ | <7,300 UJ | <730 UJ | <1,800 UJ | <730 UJ | <360 UJ | <730 UJ | <360 | NA | <360 UJ | <730 UJ | <1,800 | <1,800 | <360 UJ | <360 UJ | <360 UJ | <360 UJ | <360 UJ | <360 UJ | <3,600 UJ | <360 UJ | <360 UJ | <360 UJ | <360 UJ | <360 UJ |
| A5K290148-009 | FMSONS44/6-6.5' | NS44 | 11/21/95 | <370 | <370 | <370 | <370 | <740 | <370 | <370 | <370 | <7,400 UJ | <740 | <1,800 | <740 | <370 | <740 | <370 | NA | <370 | <740 | <1,800 | <1,800 | <370 | <370 | <370 | <370 | <370 | <370 | <3,700 UJ | <370 | <370 UJ | <370 | <370 UJ | <370 UJ |
| A5K290148-010 | FMSONS45/9-9.5" | NS45 | 11/22/95 | <400 | <400 | <400 | <400 | <810 | <400 | <400 | <400 | <8,100 UJ | <810 | <2,000 | <810 | <400 | <810 | <400 | NA | <400 | <810 | <2,000 | <2,000 | <400 | <400 | <400 | <400 | <400 | <400 | <4,000 UJ | <400 | <400 | <400 | <400 UJ | <400 UJ |
| A5K290148-011 | FMSONS46/6-6.5' (MS/MSD) | NS46 | 11/22/95 | <410 | <410 | <410 | <410 | <810 | <410 | <410 | <410 | <8,100 UJ | <810 | <2,000 | <810 | <410 | <810 | <410 | NA | <410 | <810 | <2,000 | <2,000 | <410 | <410 | <410 | <410 | <410 | NA | <4,100 UJ | <410 | <410 | <410 | <410 UJ | <410 UJ |
| A5K220162-001 | FMGWMWH | EQUIPMENT BLANK | 11/21/95 | <10 | <10 | <10 | <10 | <20 | <10 | <10 | <10 | NA | <20 | NA | <20 | <10 | <20 | <10 | NA | <10 | <20 | <50 | <50 | <10 | <10 | <10 | <10 | <10 | <10 | NA | <10 | <10 | <10 | <10 | <10 |

NOTES:

NA - NOT ANALYZED

B - (COMPOUND DETECTED IN METHOD BLANK ASSOCIATED WITH THIS SAMPLE)

MS/MSD - MATRIX SPIKE/MATRIX SPIKE DUPLICATE

+ - SAMPLE RESULTS DETERMINED BY THE METHOD OF STANDARD ADDITIONS AND THE CORRELATION COEFFICIENT WAS LESS THAN 0.995.

W - POST DIGESTION SPIKE FELL BETWEEN 40-85% WHILE THE SAMPLE RESULT WAS LESS THAN ONE-HALF THE REPORTING LIMIT.

S - SAMPLE RESULT DETERMINED BY THE METHOD OF STANDARD ADDITIONS.

HASB - HAND-AUGERED SOIL BORING

SB - SOIL BORING

- EQUIPMENT BLANK

- WATER SAMPLES, MEASURED IN ug/L.

J - ESTIMATED VALUE

UJ - ESTIMATED VALUE ( NOT DETECTED).

R - UNUSABLE (NOT DETECTED).

U - NOT DETECTED.



GERAGHTY & MILLER, INC.

Table 4-3. Soil Sample Analytical Results, SWMUs 1& 2, Near Surface Soil Sampling, Federated Metals, Hammond, Indiana.

**PARAMETER**
**Semi-Volatiles (Continued)**

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Isophorone | Isosafrole, Total | Methapyrilene | 3-Methylcholanthrene | Methyl methanesulfonate | 2-Methylnaphthalene | Naphthalene | 1,4-Naphthoquinone | 1-Naphthylamine | 2-Naphthylamine | 2-Nitroaniline | 3-Nitroaniline | 4-Nitroaniline | Nitrobenzene | 4-Nitroquinoline-1-oxide | N-Nitrosodi-n-butylamine | N-Nitrosodiethylamine | N-Nitrosodimethylamine | N-Nitrosodiphenylamine | N-Nitrosodi-n-propylamine | N-Nitrosomethylethylamine | N-Nitrosomorpholine | N-Nitrosopiperidine | N-Nitrosopyrrolidine | 5-Nitro-o-toluidine | Pentachlorobenzene | Pentachloroethane |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5K290148-001 | FMSONS37/1.5-2' | NS37 | 11/20/95 | <370 | <370 | <3,700 | <3,700 | <370 | <370 | <370 | <740 UJ | <370 | <370 | <1,800 UJ | <1,800 | <1,800 | <370 | <3,700 | <370 | <370 | <370 | <370 | <370 | <370 | <370 | <370 | <370 | <370 | <370 | <1,800 |
| A5K290148-002 | FMSONS38/5-5.5' | NS38 | 11/20/95 | <410 | <410 | <4,100 | <4,100 | <410 | <410 | <410 | <820 UJ | <410 | <410 | <2,000 UJ | <2,000 | <2,000 | <410 | <4,100 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | 91 J |
| A5K290148-003 | FMSONS39/5-5.5' | NS39 | 11/20/95 | <430 | <430 | <4,300 | <4,300 | <430 | <430 | <430 | <860 UJ | <430 | <430 | <2,100 UJ | <2,100 | <2,100 | <430 | <4,300 | <430 | <430 | <430 | <430 | <430 | <430 | <430 | <430 | <430 | <430 | <430 | <2,100 |
| A5K290148-004 | FMSONS40/4-4.5' | NS40 | 11/21/95 | <400 | <400 | <4,000 | <4,000 | <400 | <400 | <400 | <800 UJ | <400 | <400 | <1,900 UJ | <1,900 | <1,900 | <400 | <4,000 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <1,900 |
| A5K290148-005 | FMSONS41/4-4.5' | NS41 | 11/21/95 | <400 | <400 | <4,000 | <4,000 | <400 | <400 | <400 | <800 UJ | <400 | <400 | <1,900 UJ | <1,900 | <1,900 | <400 | <4,000 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <1,900 |
| A5K290148-006 | FMSONS42/3.5-4' | NS42 | 11/21/95 | <430 | <430 | <4,300 | <4,300 | <430 | <430 | <430 | <860 UJ | <430 | <430 | <2,100 UJ | <2,100 | <2,100 | <430 | <4,300 | <430 | <430 | <430 | <430 | <430 | <430 | <430 | <430 | <430 | <430 | <430 | 87J |
| A5K290148-007 | FMSONS55/3.5-4' | NS42 (DUP) | 11/21/95 | <410 | <410 | <4,100 | <4,100 | <410 | <410 | <410 | <830 UJ | <410 | <410 | <2,000 UJ | <2,000 | <2,000 | <410 | <4,100 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <2,000 |
| A5K290148-008 | FMSONS43/1-1.5' | NS43 | 11/21/95 | <360 UJ | <360 UJ | <3,600 UJ | <3,600 UJ | <360 UJ | <360 UJ | <360 UJ | <730 UJ | <360 UJ | <360 UJ | <1,800 UJ | <1,800 UJ | <1,800 UJ | <360 UJ | <3,600 UJ | <360 UJ | <360 UJ | <360 UJ | <360 UJ | <360 UJ | <360 UJ | <360 UJ | <360 UJ | <360 UJ | <360 UJ | <360 UJ | <1,800 UJ |
| A5K290148-009 | FMSONS44/6-6.5' | NS44 | 11/21/95 | <370 | <370 | <3,700 | <3,700 | <370 | <370 | <370 | <740 UJ | <370 | <370 | <1,800 UJ | <1,800 | <1,800 | <370 | <3,700 | <370 | <370 | <370 | <370 | <370 | <370 | <370 | <370 | <370 | <370 | <370 | <1,800 |
| A5K290148-010 | FMSONS45/9-9.5' | NS45 | 11/22/95 | <400 | <400 | <4,000 | <4,000 | <400 | <400 | <400 | <810 UJ | <400 | <400 | <2,000 UJ | <2,000 | <2,000 | <400 | <4,000 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <2,000 |
| A5K290148-011 | FMSONS46/6-6.5' (MS/MSD) | NS46 | 11/22/95 | <410 | <410 | <4,100 | <4,100 | <410 | <410 | <410 | <810 UJ | <410 | <410 | <2,000 UJ | <2,000 | <2,000 | <410 | <4,100 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | 100 J |
| A5K220162-001 | FMGWMWH | EQUIPMENT BLANK | 11/21/95 | <10 | <10 | <100 | <100 | <10 | <10 | <10 | <20 | <200 | <10 | <50 | <50 | <50 | <10 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <10 | <50 |

**PARAMETER**
**Semi-Volatiles (Continued)**

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Pentachloronitrobenzene | 2-Picoline | Pronamide | Pyrene | Pyridine | Safrole, Total | 1,2,4,5-Tetrachlorobenzene | Tetraethyldithiopyro-phosphate | o-Toluidine | 1,2,4-Trichlorobenzene | O,O,O-Triethyl phosphoro-thioate | 1,3,5-Trinitrobenzene | o-Cresol | m-Cresol | p-Cresol | 2-Methylphenol | 3-Methylphenol | 4-Methylphenol | Dinoseb | 2-Nitrophenol | 4-Nitrophenol | Pentachlorophenol | Phenol | 2,3,4,6-Tetrachlorophenol | Thionazin | 2,4,5-Trichlorophenol | 2,4,6-Trichlorophenol |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5K290148-001 | FMSONS37/1.5-2' | NS37 | 11/20/95 | <1,800 UJ | <740 | <740 | <370 | <370 | <370 | <370 UJ | <1,800 | <740 | <370 | <1,800 | <1,800 R | <370 | <370 | <370 | NA | NA | NA | NA | <370 | <1,800 UJ | <1,800 | <370 | <1,800 | <370 | <370 | <370 UJ |
| A5K290148-002 | FMSONS38/5-5.5' | NS38 | 11/20/95 | <2,000 UJ | <820 | <820 | <410 | <410 | <410 | <410 UJ | <2,000 | <820 | <410 | <2,000 | <2,000 R | <410 | <410 | <410 | NA | NA | NA | NA | <410 | <2,000 UJ | <2,000 | <410 | <2,000 | <410 | <410 | <410 UJ |
| A5K290148-003 | FMSONS39/5-5.5' | NS39 | 11/20/95 | <2,100 UJ | <860 | <860 | <430 | <430 | <430 | <430 UJ | <2,100 | <860 | <430 | <2,100 | <2,100 R | <430 | <430 | <430 | NA | NA | NA | NA | <430 | <2,100 UJ | <2,100 | <430 | <2,100 | <430 | <430 | <430 UJ |
| A5K290148-004 | FMSONS40/4-4.5 | NS40 | 11/21/95 | <1,900 UJ | <800 | <800 | <400 | <400 | <400 | <400 UJ | <1,900 | <800 | <400 | <1,900 | <1,900 R | <400 | <400 | <400 | NA | NA | NA | NA | <400 | <1,900 UJ | <1,900 | <400 | <1,900 | <400 | <400 | <400 UJ |
| A5K290148-005 | FMSONS41/4-4.5' | NS41 | 11/21/95 | <1,900 UJ | <800 | <800 | <400 | <400 | <400 | <400 UJ | <1,900 | <800 | <400 | <1,900 | <1,900 R | <400 | <400 | <400 | NA | NA | NA | NA | <400 | <1,900 UJ | <1,900 | <400 | <1,900 | <400 | <400 | <400 UJ |
| A5K290148-006 | FMSONS42/3.5-4' | NS42 | 11/21/95 | <2,100 UJ | <850 | <850 | <430 | <430 | <430 | <430 UJ | <2,100 | <850 | <430 | <2,100 | <2,100 R | <430 | <430 | <430 | NA | NA | NA | NA | <430 | <2,100 UJ | <2,100 | <430 | <2,100 | <430 | <430 | <430 UJ |
| A5K290148-007 | FMSONS55/3.5-4' | NS42 (DUP) | 11/21/95 | <2,000 UJ | <830 | <830 | <410 | <410 | <410 | <410 UJ | <2,000 | <830 | <410 | <2,000 | <2,000 R | <410 | <410 | <410 | NA | NA | NA | NA | <410 | <2,000 UJ | <2,000 | <410 | <2,000 | <410 | <410 | <410 UJ |
| A5K290148-008 | FMSONS43/1-1.5' | NS43 | 11/21/95 | <1,800 UJ | <730 UJ | <730 UJ | <360 UJ | <360 UJ | <360 UJ | <360 UJ | <1,800 UJ | <730 UJ | <360 UJ | <1,800 UJ | <1,800 R | <360 | <360 | <360 | NA | NA | NA | NA | <360 | <1,800 UJ | <1,800 | <360 | <1,800 | <360 UJ | <360 UJ | <360 UJ |
| A5K290148-009 | FMSONS44/6-6.5' | NS44 | 11/21/95 | <1,800 UJ | <740 | <740 | <370 | <370 | <370 | <370 UJ | <1,800 | <740 | <370 | <1,800 | <1,800 R | <370 | <370 | <370 | NA | NA | NA | NA | <370 | <1,800 UJ | <1,800 | <370 | <1,800 | <370 | <370 | <370 UJ |
| A5K290148-010 | FMSONS45/9-9.5' | NS45 | 11/22/95 | <2,000 UJ | <810 | <810 | <400 | <400 | <400 | <400 UJ | <2,000 | <810 | <400 | <2,000 | <2,000 R | <400 | <400 | <400 | NA | NA | NA | NA | <400 | <2,000 UJ | <2,000 | <400 | <2,000 | <400 | <400 | <400 UJ |
| A5K290148-011 | FMSONS46/6-6.5' (MS/MSD) | NS46 | 11/22/95 | <2,000 UJ | <810 | <810 | <410 | <410 | <410 | <410 UJ | <2,000 | <810 | <410 | <2,000 | <2,000 R | <410 | <410 | <410 | NA | NA | NA | NA | <410 | <2,000 UJ | <2,000 | <410 | <2,000 | <410 | <410 | <410 UJ |
| A5K220162-001 | FMGWMWH | EQUIPMENT BLANK | 11/21/95 | <50 | <20 | <20 | <10 | <10 | <10 | <10 | NA | <20 | <10 | NA | <50 | NA | NA | NA | <10 | <10 | <10 | NA | <10 | <50 | <50 | <10 | <50 | NA | <10 | <10 |

NOTES:
NA - NOT ANALYZED
B - (COMPOUND DETECTED IN METHOD BLANK ASSOCIATED WITH THIS SAMPLE)
MS/MSD - MATRIX SPIKE/MATRIX SPIKE DUPLICATE
+ - SAMPLE RESULTS DETERMINED BY THE METHOD OF STANDARD ADDITIONS AND THE CORRELATION COEFFICIENT WAS LESS THAN 0.995.
W - POST DIGESTION SPIKE FELL BETWEEN 40-85% WHILE THE SAMPLE RESULT WAS LESS THAN ONE-HALF THE REPORTING LIMIT.

S - SAMPLE RESULT DETERMINED BY THE METHOD OF STANDARD ADDITIONS.
HASB - HAND-AUGERED SOIL BORING
SB - SOIL BORING
- EQUIPMENT BLANK
- WATER SAMPLES, MEASURED IN ug/L.

J - ESTIMATED VALUE
UJ - ESTIMATED VALUE ( NOT DETECTED).
R - UNUSABLE (NOT DETECTED).
U - NOT DETECTED.

Table 4-3. Soil Sample Analytical Results, SWMUs 1& 2, Near Surface Soil Sampling, Federated Metals, Hammond, Indiana.

| | | | | PARAMETER Metals Results in mg/kg | | | | | | | | | | | | | | | | | PARAMETER Fluoride, Total Solids, Total Cyanide, Results in mg/kg | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Silver | Barium | Beryllium | Cadmium | Cobalt | Chromium | Copper | Nickel | Antimony | Vanadium | Zinc | Arsenic | Lead | Mercury | Selenium | Thallium | Tin | Fluoride | Solids, Total(TS) | Sulfide | Cyanide, Total |
| A5K290148-001 | FMSONS37/1.5-2' | NS37 | 11/20/95 | < 1.1 | 12.2 J | < 0.56 | < 1.1 | 9.5 | 106 | 7.8 | 55.2 | < 33.6 | 14.3 | 30.3 | 3.0 | 8.6 J | < 0.11 | < 1.1 W UJ | < 1.1 W UJ | < 112 | 39 J | NA | NA | < 0.28 |
| A5K290148-002 | FMSONS38/5-5.5' | NS38 | 11/20/95 | < 1.2 | 5.9 | < 0.62 | 5.7 | < 6.2 | 6.1 | 7.3 | 5.1 | < 37.4 | < 6.2 | 16.4 | 2.7 | 5.8 J | < 0.12 | < 0.62 S UJ | < 1.2 | < 125 | 52 J | NA | NA | < 0.31 |
| A5K290148-003 | FMSONS39/5-5.5' | NS39 | 11/20/95 | < 1.3 | 32.0 J | < 0.65 | 9.9 | < 6.5 | 8.4 | 632 J | 12.3 | 41.0 | < 6.5 | 551 | 6.1 | 378 J | < 0.13 | 1.3 S J | < 1.3 W UJ | < 130 | 52 J | NA | NA | < 0.32 |
| A5K290148-004 | FMSONS40/4-4.5' | NS40 | 11/21/95 | < 1.2 | 3.5 | < 0.61 | < 1.2 | < 6.1 | 5.7 | 5.9 | 5.6 | < 36.4 | 6.3 | 96.6 | 4.1 | 9.0 J | < 0.12 | < 0.61 W UJ | < 1.2 | < 121 | 45 J | NA | NA | < 0.30 |
| A5K290148-005 | FMSONS41/4-4.5' | NS41 | 11/21/95 | < 1.2 | 4.8 | < 0.61 | < 1.2 | < 6.1 | 3.8 | 6.1 | < 4.8 | < 36.3 | 6.5 | 38.4 | 4.8 | 5.2 J | < 0.12 | < 0.61 W UJ | < 1.2 | < 121 | < 24 J | NA | NA | < 0.30 |
| A5K290148-006 | FMSONS42/3.5-4' | NS42 | 11/21/95 | < 1.3 | 4.1 | < 0.65 | < 1.3 | < 6.5 | 3.7 | 5.7 | 5.7 | < 38.7 | 6.8 | 225 | 1.1 U | 1.5 | < 0.13 | < 0.65 W UJ | < 1.3 | < 129 | 44 J | NA | NA | < 0.32 |
| A5K290148-007 | FMSONS55/3.5-4' | NS42 (DUP) | 11/21/95 | < 1.3 | 5.0 | < 0.63 | < 1.3 | < 6.3 | 4.3 | 6.4 | 5.3 | < 37.6 | 8.5 | 236 | 0.86 U | 1.6 J | < 0.13 | < 0.63 W UJ | < 1.3 | < 125 | 34 J | NA | NA | < 0.31 |
| A5K290148-008 | FMSONS43/1-1.5' | NS43 | 11/21/95 | < 1.1 | 9.7 | < 0.55 | < 1.1 | < 5.5 | 5.6 | 44.2 J | 5.4 | < 33.1 | 8.6 | 89.6 | 2.0 | 23.4 J | < 0.11 | < 0.55 W UJ | < 1.1 W UJ | < 110 | 38 J | NA | NA | < 0.28 |
| A5K290148-009 | FMSONS44/6-6.5' | NS44 | 11/21/95 | < 1.1 | 12.1 J | < 0.56 | 6.6 | 12.1 | 116 | 297 J | 65.4 | < 33.6 | 12.4 | 1,140 | 4.4 | 448 J | < 0.11 | 1.8 S J | < 1.1 W UJ | 208 | 230 J | NA | NA | < 0.28 |
| A5K290148-010 | FMSONS45/9-9.5' | NS45 | 11/22/95 | 2.1 | 143 J | 17.0 J | 24.8 | 12.8 | 24.8 | 4,710 J | 87.2 | 413 J | 12.7 | 8,230 | 28.4 | 3,230 J | 0.20 | < 2.4 W UJ | < 1.2 UJ | 2,230 | 790 J | NA | NA | < 0.31 |
| A5K290148-011 | FMSONS46/6-6.5' (MS/MSD) | NS46 | 11/22/95 | < 1.2 | 9.9 | < 0.62 | < 1.2 | < 6.2 | 3.8 | 3.5 | < 4.9 | < 37.0 | < 6.2 | 13.0 | 3.1 | 2.8 J | < 0.12 | < 0.62 W UJ | < 1.2 | < 123 | 78 J | NA | NA | < 0.31 |
| A5K220162-001 | FMGWMWH | UIPMENT BLA | 11/21/95 | <10.0 | <10.0 | <5.0 | <10.0 | <50.0 | <20.0 | <10.0 | <40.0 | <300 | <50.0 | <50.0 | <5.0 | <3.0 | <0.20 | <5.0 | <10.0 | <1,000 | <1,000 | NA | 1,300 | <5.0 |

NOTES:
NA - NOT ANALYZED
B - (COMPOUND DETECTED IN METHOD BLANK ASSOCIATED WITH THIS SAMPLE)
MS/MSD - MATRIX SPIKE/MATRIX SPIKE DUPLICATE
+ - SAMPLE RESULTS DETERMINED BY THE METHOD OF STANDARD ADDITIONS AND THE CORRELATION COEFFICIENT WAS LESS THAN 0.995.
W - POST DIGESTION SPIKE FELL BETWEEN 40-85% WHILE THE SAMPLE RESULT WAS LESS THAN ONE-HALF THE REPORTING LIMIT.

S - SAMPLE RESULT DETERMINED BY THE METHOD OF STANDARD ADDITIONS.
HASB - HAND-AUGERED SOIL BORING
SB - SOIL BORING
- EQUIPMENT BLANK
J - ESTIMATED VALUE

UJ - ESTIMATED VALUE ( NOT DETECTED).
R - UNUSABLE (NOT DETECTED).
U - NOT DETECTED.
- WATER SAMPLES, MEASURED IN ug/L.

Table 4-4. Soil Analytical Results, SWMU #3 Near Surface Soil Sampling, Federated Metals, Hammond, Indiana.

**PARAMETERS**
**VOLATILES**
Results in ug/kg

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Acetone | Acetonitrile | Acrolein | Acrylonitrile | Allyl Chloride | 3-Chloro-1-propene | Benzene | Bromodichloromethane | Bromoform | Bromomethane | Methyl ethyl ketone | Carbon disulfide | Carbon Tetrachloride | Chlorobenzene | Chloroethane | Chloroform | Chloromethane | Chloroprene | Dibromochloromethane | 1,2-Dibromo-3-chloro-propane | 1,2-Dibromoethane | Dibromomethane | 2-Chloro-1,3-butadiene | Chlorodibromomethane | trans-1,4-Dichloro-2-butene | Dichlorodifluoromethane | 1,1-Dichloroethane | 1,2-Dichloroethane | 1,1-Dichloroethene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5C250021-009 | FMGWMWD | EQUIPMENT BLANK | 3/24/95 | <50 | <50 | <50 | <50 | NA | <5.0 | <5.0 | <5.0 | <5.0 | <10 | <50 | <5.0 | <5.0 | <5.0 | <10 | <5.0 | <10 | NA | NA | <10 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <10 | <5.0 | <5.0 | <5.0 |
| A5C250021-002 | FMSONS1/4.5-5' | SB-1 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-001 | FMSONS2/5-7' | SB-2 | 3/24/95 | <64 J | <64 J | <64 | <64 | <6.4 | NA | <6.4 | <6.4 | <6.4 | <13 | <64 | <6.4 | <6.4 | <6.4 | <13 J | <6.4 | <13 | <6.4 | NA | <13 | <6.4 | <6.4 | <6.4 | <6.4 | <6.4 | <13 J | <6.4 | <6.4 | <6.4 |
| A5F170015-005 | FMSOSB3/4-4.5 | SB-3 | 6/15/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-001 | FMSONS10/4-6' | SB-10 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-002 | FMSONS53/4-6' | SB-10 (DUP) | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-003 | FMGWMWE | EQUIPMENT BLANK | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-023 | FMSONS14/4.5-5' | SB-14 | 3/23/95 | <58 J | <58 J | <58 | <58 | <5.8 | NA | <5.8 | <5.8 | <5.8 | <12 | <58 | <5.8 | <5.8 | <5.8 | <12 J | <5.8 | <12 | <5.8 | NA | <12 | <5.8 | <5.8 | <5.8 | <5.8 | <5.8 | <12 J | <5.8 | <5.8 | <5.8 |
| A5C250021-024 | FMSONS14/5-7' | SB-14 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-025 | FMSONS52/4.5-5' | SB-14(DUP) | 3/23/95 | <56 J | <56 J | <56 | <56 | <5.6 | <56 | <5.6 | <5.6 | <5.6 | <11 | NA | <5.6 | <5.6 | <5.6 | <11 | <5.6 | <11 | <5.6 | NA | <11 | <5.6 | <5.6 | <5.6 | <5.6 | <5.6 | <11 J | <5.6 | <5.6 | <5.6 |
| A5C250021-026 | FMSONS52/5-7' | SB-14(DUP) | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | <56 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-028 | FMSONS15/6-7' | SB-15 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-021 | FMSONS16/6.5-7' | SB-16 | 3/23/95 | <63 J | <63 J | <63 R | <63 | <6.3 | NA | <6.3 | <6.3 | <6.3 | <13 | 10 J | <6.3 | <6.3 | <6.3 | <13 J | <6.3 | <13 | <6.3 | NA | <13 | <6.3 | <6.3 | <6.3 | <6.3 | <6.3 | <13 J | <6.3 | <6.3 | <6.3 |
| A5C250021-022 | FMSONS16/7-9' | SB-16 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-013 | FMSONS18/5.5-7.5' | SB-18 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-014 | FMSONS50/5.5-7.5' | SB-18(DUP) | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-015 | FMSONS19/5-7' | SB-19 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-003 | FMSONS21/5.5-6' | SB-21 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-012 | FMSONS22/5.5-6' | SB-22 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-008 | FMSONS25/1.5-2' | SB-25 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-009 | FMGWMWD | EQUIPMENT BLANK | 3/24/95 | <50 | <50 | <50 R | <50 | NA | <5.0 | <5.0 | <5.0 | <5.0 | <10 | <50 | <5.0 | <5.0 | <5.0 | <10 | <5.0 | <10 | NA | NA | <10 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 J | <10 | <5.0 | <5.0 | <5.0 |
| A5C250021-007 | FMSONS26/1-3' | SB-26 | 3/24/95 | <55 J | <55 J | <55 R | <55 | <5.5 | NA | <5.5 | <5.5 | <5.5 | <11 | 3.9J | <5.5 | <5.5 | <5.5 | <11 J | <5.5 | <11 | <5.5 | NA | <11 | <5.5 | <5.5 | <5.5 | <5.5 | <5.5 | <11 J | <5.5 | <5.5 | <5.5 |
| A5C250021-017 | FMSONS27/6-12* | HASB-27 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-018 | FMSONS51/6-12* | HASB-27(DUP) | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-016 | FMSONS28/6-12* | HASB-28 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-019 | FMSONS29/6-12* | HASB-29 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-020 | FMSONS30/6-12* | HASB-30 | 3/22/95 | <57 J | <57 J | <57 R | <57 | <5.7 | NA | <5.7 | <5.7 | <5.7 | <11 | <57 J | <5.7 | <5.7 | <5.7 | <11 J | <5.7 | <11 | <5.7 | NA | <11 | <5.7 | <5.7 | <5.7 | <5.7 | <5.7 | <11 J | <5.7 | <5.7 | <5.7 |
| A5D200054-011 | FMSONS31/1-3' | SB-31 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-013 | FMGWMWG | EQUIPMENT BLANK | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-006 | FMSONS32/1.5-2' | SB-32 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-005 | FMSONS33/2-2.5' | SB-33 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-004 | FMSONS34/2-2.5' | SB-34 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-010 | FMSONS35/1-3' | SB-35 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-009 | FMSONS36/1-3' | SB-36 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

NOTES:
NA - NOT ANALYZED
B - (COMPOUND DETECTED IN METHOD BLANK ASSOCIATED WITH THIS SAMPLE)
MS/MSD - MATRIX SPIKE/MATRIX SPIKE DUPLICATE
+ - SAMPLE RESULTS DETERMINED BY THE METHOD OF STANDARD ADDITIONS AND THE CORRELATION COEFFICIENT WAS LESS THAN 0.995.
W - POST DIGESTION SPIKE FELL BETWEEN 40-85% WHILE THE SAMPLE RESULT WAS LESS THAN ONE-HALF THE REPORTING LIMIT.

S - SAMPLE RESULT DETERMINED BY THE METHOD OF STANDARD ADDITIONS.
HASB - HAND-AUGERED SOIL BORING
SB - SOIL BORING
- EQUIPMENT BLANK
- WATER SAMPLES, MEASURED IN ug/L.

J - ESTIMATED VALUE
UJ - ESTIMATED VALUE ( NOT DETECTED).
R - UNUSABLE (NOT DETECTED).
U - NOT DETECTED.

Table 4-4. Soil Analytical Results, SWMU #3 Near Surface Soil Sampling, Federated Metals, Hammond, Indiana.

| | | | | PARAMETERS | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | VOLATILES (Continued) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | Results in ug/kg | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | 1,2-Dichloroethene, Total | 1,2-Dichloropropane | cis-1,3-Dicloropropene | trans-1,3-Dichloropropene | 1,4-Dioxane | Ethylbenzene | Ethyl methacrylate | 2-Hexanone | Iodomethane | Isobutyl alcohol | Methacrylonitrile | Methylene chloride | Methyl methacrylate | 4-Methyl-2-pentanone | Propionitrile | Styrene | 1,1,1,2-Tetrachloroethane | 1,1,2,2-Tetrachloroethane | Tetrachloroethene | Toluene | 1,1,1-Trichloroethane | 1,1,2-Trichloroethane | Trichloroethene | Trichlorofluoromethane | 1,2,3-Trichloropropane | Vinyl acetate | Vinyl chloride | Xylenes, Total | Methyl Iodide |
| A5C250021-009 | FMGWMWD | EQUIPMENT BLANK | 3/24/95 | <5.0 | <5.0 | <5.0 | <5.0 | <1,000 | <5.0 | <5.0 | <50 | <10 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <10 | <5.0 | <5.0 |
| A5C250021-002 | FMSONS1/4.5-5' | SB-1 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-001 | FMSONS2/5-7' | SB-2 | 3/24/95 | <6.4 | <6.4 | <6.4 | <6.4 | <1,300 R | <6.4 | <6.4 | <64 | NA | <640 R | <26 | <6.4 | <6.4 | <64 | <26 | <6.4 | <6.4 | <6.4 | <6.4 | <6.4 | <6.4 | <6.4 | <6.4 | <6.4 | <6.4 | <64 | <13 | <6.4 | <13 |
| A5F170015-005 | FMSOSB3/4-4.5 | SB-3 | 6/15/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-001 | FMSONS10/4-6' | SB-10 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-002 | FMSONS53/4-6' | SB-10 (DUP) | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-003 | FMGWMWE | EQUIPMENT BLANK | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-023 | FMSONS14/4.5-5' | SB-14 | 3/23/95 | <5.8 | <5.8 | <5.8 | <5.8 | <1,200 R | <5.8 | <5.8 | <58 | NA | <580 R | <23 | 4.0 J | <5.8 | <58 | <23 | <5.8 | <5.8 | <5.8 | <5.8 | <5.8 | <5.8 | <5.8 | <5.8 | <5.8 | <5.8 | <58 | <12 | <5.8 | <12 |
| A5C250021-024 | FMSONS14/5-7' | SB-14 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-025 | FMSONS52/4.5-5' | SB-14(DUP) | 3/23/95 | <5.6 | <5.6 | <5.6 | <5.6 | <1,100 R | <5.6 | <5.6 | <56 | NA | <560 R | <22 | <5.6 | <5.6 | <56 | <22 | <5.6 | <5.6 | <5.6 | <5.6 | <5.6 | <5.6 | <5.6 | <5.6 | <5.6 | <5.6 | <56 | <11 | <5.6 | <11 |
| A5C250021-026 | FMSONS52/5-7' | SB-14(DUP) | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-028 | FMSONS15/6-7' | SB-15 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-021 | FMSONS16/6.5-7' | SB-16 | 3/23/95 | <6.3 | <6.3 | <6.3 | <6.3 | <1,300 R | <6.3 | <6.3 | <63 | NA | <630 R | <25 J | 6.7 | <6.3 | <63 J | <25 J | <6.3 | <6.3 | <6.3 | <6.3 | <6.3 | <6.3 | <6.3 | <6.3 | <6.3 | <6.3 J | <6.3 | <63 J | <13 | <6.3 | <13 |
| A5C250021-022 | FMSONS16/7-9' | SB-16 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-013 | FMSONS18/5.5-7.5' | SB-18 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-014 | FMSONS50/5.5-7.5' | SB-18(DUP) | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-015 | FMSONS19/5-7' | SB-19 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-003 | FMSONS21/5.5-6' | SB-21 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-012 | FMSONS22/5.5-6' | SB-22 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-008 | FMSONS25/1.5-2' | SB-25 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-009 | FMGWMWD | EQUIPMENT BLANK | 3/24/95 | <5.0 | <5.0 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <10 | <500 R | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A5C250021-007 | FMSONS26/1-3' | SB-26 | 3/24/95 | <5.5 | <5.5 | <5.5 | <5.5 | <1,100 R | <5.5 | <5.5 | <55 | NA | <550 R | <22 R | <5.5 | <5.5 | <55 J | <22 J | <5.5 | <5.5 | <5.5 | <5.5 | <5.5 | <5.5 | <5.5 | <5.5 | <5.5 | <5.5 J | <5.5 | <55 J | <11 | <5.5 | <11 |
| A5C250021-017 | FMSONS27/6-12* | HASB-27 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-018 | FMSONS51/6-12* | HASB-27(DUP) | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-016 | FMSONS28/6-12* | HASB-28 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-019 | FMSONS29/6-12* | HASB-29 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-020 | FMSONS30/6-12* | HASB-30 | 3/22/95 | <5.7 | <5.7 | <5.7 | <5.7 | <1,100 R | <5.7 | <5.7 | <57 | NA | <570 R | <23 R | <5.7 | <5.7 | <57 J | <23 J | <5.7 | <5.7 | <5.7 | <5.7 | <5.7 | <5.7 | <5.7 | <5.7 | <5.7 | <5.7 J | <5.7 | <57 J | <11 | <5.7 | <11 |
| A5D200054-011 | FMSONS31/1-3' | SB-31 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-013 | FMGWMWG | EQUIPMENT BLANK | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-006 | FMSONS32/1.5-2' | SB-32 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-005 | FMSONS33/2-2.5' | SB-33 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-004 | FMSONS34/2-2.5' | SB-34 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-010 | FMSONS35/1-3' | SB-35 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-009 | FMSONS36/1-3' | SB-36 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

NOTES:

NA - NOT ANALYZED

B - (COMPOUND DETECTED IN METHOD BLANK ASSOCIATED WITH THIS SAMPLE)

MS/MSD - MATRIX SPIKE/MATRIX SPIKE DUPLICATE

+ - SAMPLE RESULTS DETERMINED BY THE METHOD OF STANDARD ADDITIONS AND THE CORRELATION COEFFICIENT WAS LESS THAN 0.995.

W - POST DIGESTION SPIKE FELL BETWEEN 40-85% WHILE THE SAMPLE RESULT WAS LESS THAN ONE-HALF THE REPORTING LIMIT.

S - SAMPLE RESULT DETERMINED BY THE METHOD OF STANDARD ADDITIONS.

HASB - HAND-AUGERED SOIL BORING

SB - SOIL BORING

- EQUIPMENT BLANK

- WATER SAMPLES, MEASURED IN ug/L.

J - ESTIMATED VALUE

UJ - ESTIMATED VALUE ( NOT DETECTED).

R - UNUSABLE (NOT DETECTED).

U - NOT DETECTED.

Table 4-4. Soil Analytical Results, SWMU #3 Near Surface Soil Sampling, Federated Metals, Hammond, Indiana.

| | | | | PARAMETER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Semi-Volatiles | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Acenapthene | Acenaphthylene | Acetophenone | 2-Acetylaminofluorene | 4-Aminobiphenyl | Aniline | Anthracene | Aramite, Total | Benzo (a) anthracene | Benzo (b) fluoranthene | Benzo (k) fluoranthene | Benzo (g,h,i) perylene | Benzo (a) pyrene | Benzyl alcohol | bis(2-Chloroisopropyl)ether | bis(2-Ethylhexyl)phthalate | 4-Bromophenyl phenyl ether | Butyl benzyl phthalate | 2-sec-Butyl-4,6-dinitro-phenol | 4-Chloroaniline | p-Chlorobenzilate | bis (2-Chloroethoxy) methane | bis(2-Chloroethyl)ether | bis(2-Chloro-1-methylethyl) ether | 4-Chloro-3-methylphenol | 2-Chloronaphthalene | 2-Chlorophenol | 4-Chlorophenyl phenyl ether | Chrysene | Diallate | Dibenz(a,h)anthracene | Dibenzofuran |
| A5C250021-009 | FMGWMWD | EQUIPMENT BLANK | 3/24/95 | <10 | <10 | <10 | <20 | <50 | <10 | <10 | NA | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | NA | <10 | <10 | <10 | <10 | NA | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| A5C250021-002 | FMSONS1/4.5-5' | SB-1 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-001 | FMSONS2/5-7' | SB-2 | 3/24/95 | <420 | <420 | <420 | <850 | <2100 | <420 | <420 | <420 J | <420 | <420 | <420 J | <420 J | <420 J | <420 | <420 | <420 | <420 | <420 | NA | <420 | <420 | <420 | <420 | NA | <420 | <420 | <420 | <420 | <420 | <420 J | <420 | <420 | <420 |
| A5F170015-005 | FMSOSB3/4-4.5 | SB-3 | 6/15/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-001 | FMSONS10/4-6' | SB-10 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-002 | FMSONS53/4-6' | SB-10 (DUP) | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-003 | FMGWMWE | EQUIPMENT BLANK | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-023 | FMSONS14/4.5-5' | SB-14 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-024 | FMSONS14/5-7' | SB-14 | 3/23/95 | <410 | <410 | <410 | <820 | <2,000 | <410 | 79 J | NA | 190 J | 210 J | 91 J | 74 J | 160 J | <410 | <410 | <410 | <410 | <410 | NA | <410 | <410 | <410 | <410 | NA | <410 | <410 | <410 | <410 | 260 J | <410 | <410 J | <410 |
| A5C250021-025 | FMSONS52/4.5-5' | SB-14(DUP) | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-026 | FMSONS52/5-7' | SB-14(DUP) | 3/23/95 | 89 J | <390 | <390 | <780 | <1,900 | <390 | 280 J | NA | 500 | 420 | 180 J | 130 J | 320 J | <390 | <390 | 710 | <390 | <390 | NA | <390 | <390 | <390 | <390 | NA | <390 | <390 | <390 | <390 | 550 | <390 | <390 | 86 J |
| A5C250021-028 | FMSONS15/6-7' | SB-15 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-021 | FMSONS16/6.5-7' | SB-16 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-022 | FMSONS16/7-9' | SB-16 | 3/23/95 | <390 | <390 | <390 | <790 | <1,900 | <390 | <390 | NA | <390 J | <390 | <390 J | <390 J | <390 | <390 | <390 | <390 | <390 | <390 | NA | <390 | <390 | <390 | <390 | NA | <390 | <390 | <390 | <390 | <390 | <390 | <390 J | <390 |
| A5C250021-013 | FMSONS18/5.5-7.5' | SB-18 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-014 | FMSONS50/5.5-7.5' | SB-18(DUP) | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-015 | FMSONS19/5-7' | SB-19 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-003 | FMSONS21/5.5-6' | SB-21 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-012 | FMSONS22/5.5-6' | SB-22 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-008 | FMSONS25/1.5-2' | SB-25 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-009 | FMGWMWD | EQUIPMENT BLANK | 3/24/95 | <10 | <10 | <10 | <20 | <50 | <10 | <10 | NA | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | NA | <10 | <10 | <10 | <10 | NA | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| A5C250021-007 | FMSONS26/1-3' | SB-26 | 3/24/95 | <370 | <370 | <370 | <730 | <1,800 | <370 | <370 | NA | <370 J | <370 | <370 J | <370 J | <370 | <370 | <370 | <370 | <370 | <370 | NA | <370 | <370 | <370 | <370 | NA | <370 | <370 | <370 | <370 | <370 | <370 J | <370 | <370 | <370 |
| A5C250021-017 | FMSONS27/6-12" | HASB-27 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-018 | FMSONS51/6-12" | HASB-27(DUP) | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-016 | FMSONS28/6-12" | HASB-28 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-019 | FMSONS29/6-12" | HASB-29 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-020 | FMSONS30/6-12" | HASB-30 | 3/22/95 | <1,500 | <1,500 | <1,500 | <3,000 | <7,300 | <1,500 | <1,500 | NA | <1,500 J | <1,500 | <1,500 J | <1,500 | <1,500 | <1,500 | <1,500 | <1,500 | <1,500 | <1,500 | NA | <1,500 | <1,500 | <1,500 | <1,500 | NA | <1,500 | <1,500 | <1,500 | <1,500 | <1,500 | <1,500 | <1,500 J | <1,500 |
| A5D200054-011 | FMSONS31/1-3' | SB-31 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-013 | FMGWMWG | EQUIPMENT BLANK | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-006 | FMSONS32/1.5-2' | SB-32 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-005 | FMSONS33/2-2.5' | SB-33 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-004 | FMSONS34/2-2.5' | SB-34 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-010 | FMSONS35/1-3' | SB-35 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-009 | FMSONS36/1-3' | SB-36 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

NOTES:

NA - NOT ANALYZED

B - (COMPOUND DETECTED IN METHOD BLANK ASSOCIATED WITH THIS SAMPLE)

MS/MSD - MATRIX SPIKE/MATRIX SPIKE DUPLICATE

+ - SAMPLE RESULTS DETERMINED BY THE METHOD OF STANDARD ADDITIONS AND THE CORRELATION COEFFICIENT WAS LESS THAN 0.995.

W - POST DIGESTION SPIKE FELL BETWEEN 40-85% WHILE THE SAMPLE RESULT WAS LESS THAN ONE-HALF THE REPORTING LIMIT.

S - SAMPLE RESULT DETERMINED BY THE METHOD OF STANDARD ADDITIONS.

HASB - HAND-AUGERED SOIL BORING

SB - SOIL BORING

- EQUIPMENT BLANK

- WATER SAMPLES, MEASURED IN ug/L.

J - ESTIMATED VALUE

UJ - ESTIMATED VALUE ( NOT DETECTED).

R - UNUSABLE (NOT DETECTED).

U - NOT DETECTED.

Table 4-4. Soil Analytical Results, SWMU #3 Near Surface Soil Sampling, Federated Metals, Hammond, Indiana.

| | | | | PARAMETER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Semi-Volatiles (Continued) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Di-n-butyl phthalate | 1,2-Dichlorobenzene | 1,3-Dichlorobenzene | 1,4-Dichlorobenzene | 3,3'-Dichlorobenzidine | 2,4-Dichlorophenol | 2,6-Dichlorophenol | Diethyl phthalate | Dimethoate | p-(Dimethylamino)azobenzene | Disulfoton | 7,12-Dimethylbenz(a)-anthracene | 3,3'-Dimethylbenzidine | a,a-Dimethylphenethylamine | 2,4-Dimethylphenol | alpha,alpha-Dimethyl phenethyl | Dimethyl phthalate | 1,3-Dinitrobenzene | 4,6-Dinitro-2-methylphenol | 2,4-Dinitrophenol | 2,4-Dinitrotoluene | 2,6-Dinitrotoluene | Di-n-octyl phthalate | Diphenylamine | bis(2-Ethylhexyl) phthalate | Ethyl methanesulfonate | Famphur | Fluoranthene | Fluorene | Hexachlorobenzene | Hexachlorobutadiene | Hexachlorocyclopentadiene |
| A5C250021-009 | FMGWMWD | EQUIPMENT BLANK | 3/24/95 | <10 | <10 | <10 | <10 | <20 | <10 | <10 | <10 | <200 | <20 | <10 | <100 | <50 | NA | <10 | <50 | <10 | <10 | <50 | <50 | <10 | <10 | <10 | <10 | NA | <10 | <100 | <10 | <10 | <10 | <10 | <10 |
| A5C250021-002 | FMSONS1/4.5-5' | SB-1 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-001 | FMSONS2/5-7' | SB-2 | 3/24/95 | <420 | <420 | <420 | <420 | <850 | <420 | <420 | <420 | <8500 | <850 | NA | <4200 | <2100 | NA | <420 | <2100 J | <420 | <420 | <2100 | <2100 | <420 | <420 | <420 | <420 | NA | <420 | NA | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 |
| A5F170015-005 | FMSOSB3/4-4.5 | SB-3 | 6/15/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-001 | FMSONS10/4-6' | SB-10 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-002 | FMSONS53/4-6' | SB-10 (DUP) | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-003 | FMGWMWE | EQUIPMENT BLANK | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-023 | FMSONS14/4.5-5' | SB-14 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-024 | FMSONS14/5-7' | SB-14 | 3/23/95 | <410 | <410 | <410 | <410 | <820 | <410 | <410 | <410 | <8,200 | <820 | NA | <4,100 | <2,000 | NA | <410 | <2,000 J | <410 | <410 | <2,000 | <2,000 | <410 | <410 | <410 | <410 | NA | <410 | NA | 350 J | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 |
| A5C250021-025 | FMSONS52/4.5-5' | SB-14(DUP) | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-026 | FMSONS52/5-7' | SB-14(DUP) | 3/23/95 | <390 | <390 | <390 | <390 | <780 | <390 | <390 | <390 | <7,800 | <780 | NA | <3,900 | <1,900 | NA | <390 | <1,900 J | <390 | <390 | <1,900 | <1,900 | <390 | <390 | <390 | <390 | NA | <390 | NA | 950 | 95J | <390 | <390 | <390 | <390 | <390 | <390 | <390 | <390 |
| A5C250021-028 | FMSONS15/6-7' | SB-15 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-021 | FMSONS16/6.5-7' | SB-16 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-022 | FMSONS16/7-9' | SB-16 | 3/23/95 | <390 | <390 | <390 | <390 | <790 | <390 | <390 | <390 | <7,900 | <790 | NA | <3,900 | <1,900 | NA | <390 | 1,900 J | <390 | <390 | <1,900 | <1,900 | <390 | <390 | <390 | <390 | NA | <390 | NA | <390 | <390 | <390 | <390 | <390 | <390 | <390 | <390 | <390 | <390 |
| A5C250021-013 | FMSONS18/5.5-7.5' | SB-18 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-014 | FMSONS50/5.5-7.5' | SB-18(DUP) | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-015 | FMSONS19/5-7' | SB-19 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-003 | FMSONS21/5.5-6' | SB-21 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-012 | FMSONS22/5.5-6' | SB-22 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-008 | FMSONS25/1.5-2' | SB-25 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-009 | FMGWMWD | EQUIPMENT BLANK | 3/24/95 | <10 | <10 | <10 | <10 | <20 | <10 | <10 | <10 | <200 | <20 | <10 | <100 | <50 | NA | <10 | <50 | <10 | <10 | <50 | <50 | <10 | <10 | <10 | <10 | NA | <10 | <100 | <10 | <10 | <10 | <10 | <10 | | | | |
| A5C250021-007 | FMSONS26/1-3' | SB-26 | 3/24/95 | <370 | <370 | <370 | <370 | <730 | <370 | <370 | <370 | <7,300 | <730 | NA | <3,700 | <1,800 | NA | <370 | <1,800 J | <370 | <370 | <1,800 | <1,800 | <370 | <370 | <370 | <370 | NA | <370 | <370 | <370 | <370 | <370 | <370 | <370 | | | | |
| A5C250021-017 | FMSONS27/6-12" | HASB-27 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | | | | |
| A5C250021-018 | FMSONS51/6-12" | HASB-27(DUP) | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | | | | |
| A5C250021-016 | FMSONS28/6-12" | HASB-28 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | | | | |
| A5C250021-019 | FMSONS29/6-12" | HASB-29 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | | | | |
| A5C250021-020 | FMSONS30/6-12" | HASB-30 | 3/22/95 | <1,500 | <1,500 | <1,500 | <1,500 | <3,000 | <1,500 | <1,500 | <1,500 | <30,000 | <3,000 | NA | <15,000 | <7,300 | NA | <1,500 | <7,300 | <1,500 | <1,500 | <7,300 | <7,300 | <1,500 | <1,500 | <1,500 | <1,500 | NA | <1,500 | NA | <1,500 | <1,500 | <1,500 | <1,500 | <1,500 | | | | |
| A5D200054-011 | FMSONS31/1-3' | SB-31 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | | | | |
| A5D200054-013 | FMGWMWG | EQUIPMENT BLANK | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | | | | |
| A5C250021-006 | FMSONS32/1.5-2' | SB-32 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | | | | |
| A5C250021-005 | FMSONS33/2-2.5' | SB-33 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | | | | |
| A5C250021-004 | FMSONS34/2-2.5' | SB-34 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | | | | |
| A5D200054-010 | FMSONS35/1-3' | SB-35 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | | | | |
| A5D200054-009 | FMSONS36/1-3' | SB-36 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | | | | |

NOTES:

NA - NOT ANALYZED

B - (COMPOUND DETECTED IN METHOD BLANK ASSOCIATED WITH THIS SAMPLE)

MS/MSD - MATRIX SPIKE/MATRIX SPIKE DUPLICATE

+ - SAMPLE RESULTS DETERMINED BY THE METHOD OF STANDARD ADDITIONS AND THE CORRELATION COEFFICIENT WAS LESS THAN 0.995.

W - POST DIGESTION SPIKE FELL BETWEEN 40-85% WHILE THE SAMPLE RESULT WAS LESS THAN ONE-HALF THE REPORTING LIMIT.

S - SAMPLE RESULT DETERMINED BY THE METHOD OF STANDARD ADDITIONS.

HASB - HAND-AUGERED SOIL BORING

SB - SOIL BORING

[redacted] - EQUIPMENT BLANK

- WATER SAMPLES, MEASURED IN ug/L.

J - ESTIMATED VALUE

UJ - ESTIMATED VALUE ( NOT DETECTED).

R - UNUSABLE (NOT DETECTED).

U - NOT DETECTED.

Table 4-4. Soil Analytical Results, SWMU #3 Near Surface Soil Sampling, Federated Metals, Hammond, Indiana.

| | | | | PARAMETER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Semi-Volatiles (Continued) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Hexachloroethane | Hexachlorophene | Hexachloropropene | Indeno(1,2,3-cd)pyrene | Isophorone | Isosafrole, Total | Methapyrilene | 3-Methylcholanthrene | Methyl methanesulfonate | 2-Methylnaphthalene | Naphthalene | 1,4-Naphthoquinone | 1-Naphthylamine | 2-Naphthylamine | 2-Nitroaniline | 3-Nitroaniline | 4-Nitroaniline | Nitrobenzene | 4-Nitroquinoline-1-oxide | N-Nitrosodi-n-butylamine | N-Nitrosodiethylamine | N-Nitrosodimethylamine | N-Nitrosodiphenylamine | N-Nitrosodi-n-propylamine | N-Nitrosomethylethylamine | N-Nitrosomorpholine | N-Nitrosopiperidine | N-Nitrosopyrrolidine | 5-Nitro-o-toluidine | Pentachlorobenzene | Pentachloroethane | Pentachloronitrobenzene |
| A5C250021-009 | FMGWMWD | EQUIPMENT BLANK | 3/24/95 | <10 | NA | <100 | <10 | <10 | <10 | <100 | <100 | <10 | <10 | <10 | <200 | <10 | <10 | <50 | <50 | <50 | <10 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <50 | <50 |
| A5C250021-002 | FMSONS1/4.5-5' | SB-1 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-001 | FMSONS2/5-7' | SB-2 | 3/24/95 | <420 | NA | <4200 | <420 J | <420 | <420 | <4200 | <1900 | <420 | <420 | <420 | <8500 R | <420 | <420 | <2100 | <2100 | <2100 J | <420 | <4200 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <2100 | <2100 |
| A5F170015-005 | FMSOSB3/4-4.5 | SB-3 | 6/15/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-001 | FMSONS10/4-6' | SB-10 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-002 | FMSONS53/4-6' | SB-10 (DUP) | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-003 | FMGWMWE | EQUIPMENT BLANK | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-023 | FMSONS14/4.5-5' | SB-14 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-024 | FMSONS14/5-7' | SB-14 | 3/23/95 | <410 | NA | <4,100 | 71 J | <410 | <410 | <4,100 | <1,900 | <410 | 44 J | <410 | <8,200 R | <410 | <410 | <2,000 | <2,000 | <2,000 | <410 | <4,100 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <2,000 | <2,000 |
| A5C250021-025 | FMSONS52/4.5-5' | SB-14(DUP) | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-026 | FMSONS52/5-7' | SB-14(DUP) | 3/23/95 | <390 | NA | <3,900 | 120J | <390 | <390 | <3,900 | <1,800 | <390 | 64J | 84J | <7,800 R | <390 | <390 | <1,900 | <1,900 | <1,900 | <390 | <3,900 | <390 | <390 | <390 | <390 | <390 | <390 | <390 | <390 | <390 | <390 | <1,900 | <1,900 |
| A5C250021-028 | FMSONS15/6-7' | SB-15 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-021 | FMSONS16/6.5-7' | SB-16 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-022 | FMSONS16/7-9' | SB-16 | 3/23/95 | <390 | NA | <3,900 | <390 J | <390 | <390 | <3,900 | <1,800 | <390 | <390 | <390 | <7,900 R | <390 | <390 | <1,900 | <1,900 | <1,900 J | <390 | <3,900 | <390 | <390 | <390 | <390 | <390 | <390 | <390 | <390 | <390 | <390 | 160 J | <1,900 |
| A5C250021-013 | FMSONS18/5.5-7.5' | SB-18 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-014 | FMSONS50/5.5-7.5' | SB-18(DUP) | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-015 | FMSONS19/5-7' | SB-19 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-003 | FMSONS21/5.5-6' | SB-21 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-012 | FMSONS22/5.5-6' | SB-22 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-008 | FMSONS25/1.5-2' | SB-25 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-009 | FMGWMWD | EQUIPMENT BLANK | 3/24/95 | <10 | NA | <100 | <10 | <10 | <10 | <100 | <100 | <10 | <10 | <10 | <200 R | <10 | <10 | <50 | <50 | <50 | <10 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <50 | <50 |
| A5C250021-007 | FMSONS26/1-3' | SB-26 | 3/24/95 | <3,700 | NA | <370 | <370 J | <370 | <370 | <3,700 | <1,700 | <370 | <370 | <370 | <7,300 R | <370 | <370 | <1,800 | <1,800 | <1,800 J | <370 | <3,700 | <370 | <370 | <370 | <370 | <370 | <370 | <370 | <370 | <370 | <370 | <1,800 | <1,800 |
| A5C250021-017 | FMSONS27/6-12" | HASB-27 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-018 | FMSONS51/6-12" | HASB-27(DUP) | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-016 | FMSONS28/6-12" | HASB-28 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-019 | FMSONS29/6-12" | HASB-29 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-020 | FMSONS30/6-12" | HASB-30 | 3/22/95 | <1,500 | NA | <15,000 | <1,500 J | <1,500 | <1,500 | <15,000 | <6,800 | <1,500 | <1,500 | <1,500 | <30,000 R | <1,500 | <1,500 | <7,300 | <7,300 | <7,300 | <1,500 | <15,000 | <1,500 | <1,500 | <1,500 | <1,500 | <1,500 | <1,500 | <1,500 | <1,500 | <1,500 | <1,500 | <7,300 | <7,300 |
| A5D200054-011 | FMSONS31/1-3' | SB-31 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-013 | FMGWMWG | EQUIPMENT BLANK | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-006 | FMSONS32/1.5-2' | SB-32 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-005 | FMSONS33/2-2.5' | SB-33 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-004 | FMSONS34/2-2.5' | SB-34 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-010 | FMSONS35/1-3' | SB-35 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-009 | FMSONS36/1-3' | SB-36 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

NOTES:

NA - NOT ANALYZED

B - (COMPOUND DETECTED IN METHOD BLANK ASSOCIATED WITH THIS SAMPLE)

MS/MSD - MATRIX SPIKE/MATRIX SPIKE DUPLICATE

+ - SAMPLE RESULTS DETERMINED BY THE METHOD OF STANDARD ADDITIONS AND THE CORRELATION COEFFICIENT WAS LESS THAN 0.995.

W - POST DIGESTION SPIKE FELL BETWEEN 40-85% WHILE THE SAMPLE RESULT WAS LESS THAN ONE-HALF THE REPORTING LIMIT.

S - SAMPLE RESULT DETERMINED BY THE METHOD OF STANDARD ADDITIONS.

HASB - HAND-AUGERED SOIL BORING

SB - SOIL BORING

- EQUIPMENT BLANK

- WATER SAMPLES, MEASURED IN ug/L.

J - ESTIMATED VALUE

UJ - ESTIMATED VALUE ( NOT DETECTED).

R - UNUSABLE (NOT DETECTED).

U - NOT DETECTED.

Table 4-4. Soil Analytical Results, SWMU #3 Near Surface Soil Sampling, Federated Metals, Hammond, Indiana.

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | PARAMETER Semi-Volatiles (Continued) Phenacetin | Phenanthrene | p-Phenylene diamine | Phorate | 2-Picoline | Pronamide | Pyrene | Pyridine | Safrole, Total | 1,2,4,5-Tetrachlorobenzene | Tetraethyldithiopyro-phosphate | o-Toluidine | 1,2,4-Trichlorobenzene | O,O,O-Triethyl phosphoro-thioate | 1,3,5-Trinitrobenzene | o-Cresol | m-Cresol | p-Cresol | 2-Methylphenol | 3-Methylphenol | 4-Methylphenol | Dinoseb | 2-Nitrophenol | 4-Nitrophenol | Pentachlorophenol | Phenol | 2,3,4,6-Tetrachlorophenol | Thionazin | 2,4,5-Trichlorophenol | 2,4,6-Trichlorophenol |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5C250021-009 | FMGWMWD | EQUIPMENT BLANK | 3/24/95 | <50 | <10 | <50 | <50 | <20 | <20 | <10 | <10 | <10 | <10 | <50 | <10 | <10 | <50 | <50 | NA | NA | NA | <10 | <10 | <10 | <50 | <50 | <50 | <50 | <10 | <50 | NA | <10 | <10 |
| A5C250021-002 | FMSONS1/4.5-5' | SB-1 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-001 | FMSONS2/5-7' | SB-2 | 3/24/95 | <2100 | <420 | <2100 J | NA | <850 | <850 | <420 | <420 | <420 | <420 | <2100 | <420 | <420 | <2100 | <2100 J | NA | NA | NA | <420 | <420 | <420 | NA | <420 | <2100 | <2100 | <420 | <2100 | NA | <420 | <420 |
| A5F170015-005 | FMSOSB3/4-4.5 | SB-3 | 6/15/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-001 | FMSONS10/4-6' | SB-10 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-002 | FMSONS53/4-6' | SB-10 (DUP) | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-003 | FMGWMWE | EQUIPMENT BLANK | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-023 | FMSONS14/4.5-5' | SB-14 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-024 | FMSONS14/5-7' | SB-14 | 3/23/95 | <2,000 | 310 J | <2,000 J | | <820 | <820 | 300 J | <410 | <410 | <410 | <2,000 | <410 | <410 | <2,000 | <2,000 J | NA | NA | NA | <410 | <410 | <410 | NA | <410 | <2,000 | <2,000 | <410 | <2,000 | NA | <410 | <410 |
| A5C250021-025 | FMSONS52/4.5-5' | SB-14(DUP) | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-026 | FMSONS52/5-7' | SB-14(DUP) | 3/23/95 | <1,900 | 1,100 | <1,900 J | NA | <780 | <780 | 740 | <390 | <390 | <390 | <1,900 | <390 | <390 | <1,900 | <1,900 J | NA | NA | NA | <390 | <390 | <390 | NA | <390 | <1,900 | <1,900 | <390 | <1,900 | NA | <390 | <390 |
| A5C250021-028 | FMSONS15/6-7' | SB-15 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-021 | FMSONS16/6.5-7' | SB-16 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-022 | FMSONS16/7-9' | SB-16 | 3/23/95 | <1,900 | <390 | <1,900 J | NA | <790 | <790 | <390 | <390 | <390 | <390 | <1,900 | <390 | <390 | <1,900 | <1,900 J | NA | NA | NA | <390 | <390 | <390 | | <390 | <1,900 | <1,900 | <390 | <1,900 | NA | <390 | <390 |
| A5C250021-013 | FMSONS18/5.5-7.5' | SB-18 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-014 | FMSONS50/5.5-7.5' | SB-18(DUP) | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-015 | FMSONS19/5-7' | SB-19 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-003 | FMSONS21/5.5-6' | SB-21 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-012 | FMSONS22/5.5-6' | SB-22 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-008 | FMSONS25/1.5-2' | SB-25 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-009 | FMGWMWD | EQUIPMENT BLANK | 3/24/95 | <50 | <10 | <50 | <50 | <20 | <20 | <10 | <10 | <10 | <10 | <50 | <10 | <10 | <50 | <50 J | NA | NA | NA | <10 | <10 | <10 | <50 | <50 | <50 | <50 | <10 | <50 | NA | <10 | <10 |
| A5C250021-007 | FMSONS26/1-3' | SB-26 | 3/24/95 | <1,800 | <370 | <1,800 J | NA | <730 | <730 | <370 | <370 | <370 | <370 | <1,800 | <370 | <370 | <1,800 | <1,800 J | NA | NA | NA | <370 | <370 | <370 | NA | <370 | <1,800 | <1,800 | <370 | <1,800 | NA | <370 | <370 |
| A5C250021-017 | FMSONS27/6-12' | HASB-27 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-018 | FMSONS51/6-12' | HASB-27(DUP) | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-016 | FMSONS28/6-12' | HASB-28 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-019 | FMSONS29/6-12' | HASB-29 | 3/22/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-020 | FMSONS30/6-12' | HASB-30 | 3/22/95 | <7,300 | <1,500 | <7,300 J | <3,000 | <3,000 | <1,500 | <1,500 | <1,500 | <1,500 | <7,300 | <1,500 | <1,500 | <1,500 | <7,300 | <7,300 J | NA | NA | NA | <1,500 | <1,500 | <1,500 | NA | <1,500 | <7,300 | <7,300 | <1,500 | <7,300 | NA | <1,500 | <1,500 |
| A5D200054-011 | FMSONS31/1-3' | SB-31 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-013 | FMGWMWG | EQUIPMENT BLANK | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-006 | FMSONS32/1.5-2' | SB-32 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-005 | FMSONS33/2-2.5' | SB-33 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-004 | FMSONS34/2-2.5' | SB-34 | 3/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-010 | FMSONS35/1-3' | SB-35 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-009 | FMSONS36/1-3' | SB-36 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

NOTES:

NA - NOT ANALYZED

B - (COMPOUND DETECTED IN METHOD BLANK ASSOCIATED WITH THIS SAMPLE)

MS/MSD - MATRIX SPIKE/MATRIX SPIKE DUPLICATE

+ - SAMPLE RESULTS DETERMINED BY THE METHOD OF STANDARD ADDITIONS AND THE CORRELATION COEFFICIENT WAS LESS THAN 0.995.

W - POST DIGESTION SPIKE FELL BETWEEN 40-85% WHILE THE SAMPLE RESULT WAS LESS THAN ONE-HALF THE REPORTING LIMIT.

S - SAMPLE RESULT DETERMINED BY THE METHOD OF STANDARD ADDITIONS.

HASB - HAND-AUGERED SOIL BORING

SB - SOIL BORING

- EQUIPMENT BLANK

- WATER SAMPLES, MEASURED IN ug/L.

J - ESTIMATED VALUE

UJ - ESTIMATED VALUE ( NOT DETECTED).

R - UNUSABLE (NOT DETECTED).

U - NOT DETECTED.

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Table 4-4. Soil Analytical Results, SWMU #3 Near Surface Soil Sampling, Federated Metals, Hammond, Indiana.

| | | | | PARAMETER Metals Results in mg/kg | | | | | | | | | | | | | | | | | PARAMETER Fluoride, Total Solids, Total Cyanide, Results in mg/kg | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Silver | Barium | Beryllium | Cadmium | Cobalt | Chromium | Copper | Nickel | Antimony | Vanadium | Zinc | Arsenic | Lead | Mercury | Selenium | Thallium | Tin | Fluoride | Solids, Total(TS) | Cyanide, Total |
| A5C250021-009 | FMGWMWD | EQUIPMENT BLANK | 3/24/95 | <10.0 | <10.0 | <5.0 | <10.0 | <50.0 | <20.0 | <10.0 | <40.0 | <300 | <50.0 | <50.0 | <5.0 | <3.0 | <0.20 | <5.0 | <10.0 | <1,000 | <1.2 UJ | NA | <0.005 |
| A5C250021-002 | FMSONS1/4.5-5' | SB-1 | 3/24/95 | <1.0 | 7.8 | <0.50 | <1.0 | <5.0 | 3.4 | 2.5 | <4.0 | <30.0 J | 6.3 | 13.1 | 1.2 | 2.2 | <0.10 | W <0.50 J | <1.0 | <100 | 46 J | 76.3 | <0.33 |
| A5C250021-001 | FMSONS2/5-7' | SB-2 | 3/24/95 | <1.0 | 31 | <0.50 | <1.0 | <5.0 | 8.3 | 687 | 12.1 | <30 J | 5.9 | 743 | 13.2 | 252 | 0.11 | W *<1.0 J | <1.0 | 117 | 39 J | 77.8 | <0.32 |
| A5F170015-005 | FMSOSB3/4-4.5 | SB-3 | 6/15/95 | <1.0 | 34.3 | <0.50 | 15.0 | <5.0 | 9.5 | 1,130 | 44.5 | 39.4 | 10.7 | 1,360 | 26.6 | 136 | <0.10 | 5.8 | <1.0 | 784 | 120 J | 75.3 | <0.33 |
| A5D200054-001 | FMSONS10/4-6' | SB-10 | 4/18/95 | <1.0 | 32.9 J | 0.60 UB | 7.5 J | <5.0 | 6.3 | 1,780 J | 220 J | 58.2 | 7.9 | 2,590 J | 14.2 | 1,540 | <0.50 | 1.O J | <1.0 | 189 J | <24 UJ | 81.8 | <0.31 J |
| A5D200054-002 | FMSONS53/4-6' | SB-10 (DUP) | 4/18/95 | 4 | 191 J | 0.70 U | 40.5 J | 6.5 | 15.4 | 2,650 J | 414 J | 351 | 9.6 | 4,630 J | 53.1 | 10,600 | 0.66 | 2.3 J | <1.0 | 1120 J | <26 UJ | 76.7 | <0.33 J |
| A5D200054-003 | FMGWMWE | EQUIPMENT BLANK | 4/18/95 | <10.0 | <10.0 | <5.0 | <10.0 | <50.0 | <20.0 | 36.0 | <40.0 | <300 | <50.0 | 85.0 | <5.0 | 40.8 | <0.20 | <5.0 | <10.0 | <1,000 | <1.2 J | NA | <0.005 J |
| A5C250021-023 | FMSONS14/4.5-5' | SB-14 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 86.0 | NA |
| A5C250021-024 | FMSONS14/5-7' | SB-14 | 3/23/95 | 1.5 | 703 | 2.8 | 6 | 8.1 | 14.3 | 4,310 | 114 | 82.3 | 12 | 5,530 | 11.5 | 4,840 | 0.27 | 6.0 + | <1.0 | 688 | 140 J | 80.9 | 0.34 |
| A5C250021-025 | FMSONS52/4.5-5' | SB-14(DUP) | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 89.8 | NA |
| A5C250021-026 | FMSONS52/5-7' | SB-14(DUP) | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 84.4 | NA |
| A5C250021-028 | FMSONS15/6-7' | SB-15 | 3/23/95 | <1.0 | 3.9 | <0.50 | <1.0 | <5.0 | 3.0 | 7.9 | 129 | <30 | <5.0 | 140 | 1.6 | 5.4 | <0.10 | W <0.50 | <1.0 | <100 | 360 J | 79.7 | <0.31 |
| A5C250021-021 | FMSONS16/6.5-7' | SB-16 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 79.5 | NA |
| A5C250021-022 | FMSONS16/7-9' | SB-16 | 3/23/95 | <1.0 | 4.3 | <0.50 | <1.0 | <5.0 | 4.2 | 13.4 | 18.3 | <30.0 J | <5.0 | 80.6 | 1.2 | 19.6 | <0.10 | W <0.50 J | <1.0 | <100 | <24 UJ | 84.0 | <0.30 |
| A5C250021-013 | FMSONS18/5.5-7.5' | SB-18 | 3/22/95 | <1.0 | 4.9 | <0.50 | 1.2 | <5.0 | 4.1 | 116 | 5.2 | <30.0 J | <5.0 | 228 | 2.4 | 78.4 | <0.10 | W <0.50 J | <1.0 | <100 | 46 J | 82.2 | <0.30 |
| A5C250021-014 | FMSONS50/5.5-7.5' | SB-18(DUP) | 3/22/95 | <1.0 | 5.2 | <0.50 | 1.4 | <5.0 | 7.3 | 105 | 6.8 | <30.0 J | 6.1 | 238 | 2.1 | 52.2 | <0.10 | W <0.50 J | <1.0 | <100 | 110 J | 84.4 | <0.30 |
| A5C250021-015 | FMSONS19/5-7' | SB-19 | 3/22/95 | <1.0 | 7.9 | <0.50 | 4.1 | <5.0 | 3.7 | 59.4 | 8.3 | <30.0 J | 5.2 | 1,220 | 2.6 | 63 | <0.10 | W <0.50 J | <1.0 | <100 | 58 J | 81.0 | <0.31 |
| A5C250021-003 | FMSONS21/5.5-6' | SB-21 | 3/24/95 | 1.6 | 219 | 0.90 | 9.0 | 13.6 | 22.0 | 4,320 | 51.5 | 234 | 8.1 | 1,230 | 11.3 | 8,740 | 0.39 | 0.91 S | <1.0 | 3,040 | 27 J | 83.4 | <0.30 |
| A5C250021-012 | FMSONS22/5.5-6' | SB-22 | 3/23/95 | 1.3 | 52.6 | <0.50 | 8.6 | 8.1 | 8.5 | 3,170 | 26.4 | <30.0 J | 8.7 | 4,630 | 5.8 | 3,500 | 0.51 | W <0.50 J | <1.0 | 487 | 110 J | 81.8 | <0.31 |
| A5C250021-008 | FMSONS25/1.5-2' | SB-25 | 3/24/95 | <1.0 | 67.2 | <0.50 | 1.1 | 7.4 | 14.1 | 1,650 | 108 | <30.0 J | 14.2 | 1,580 | 17.7 | 1,410 | <0.10 | W <0.50 J | <1.0 | 311 | 53 J | 84.6 | <0.30 |
| A5C250021-009 | FMGWMWD | EQUIPMENT BLANK | 3/24/95 | <10.0 | <10.0 | <5.0 | <10.0 | <50.0 | <20.0 | <10.0 | <40.0 | <300 | <50.0 | <50.0 | <5.0 | <3.0 | <0.20 | W <5.0 | <10.0 | <1,000 | <1.2 | NA | <0.005 |
| A5C250021-007 | FMSONS26/1-3' | SB-26 | 3/24/95 | <1.0 | 5.8 | <0.50 | 7.4 | 6.4 | 5.1 | 44.7 | 8.9 | <30.0 J | 5 | 383 | 2.4 | 32.7 | <0.10 | W <0.50 J | <1.0 | <100 | 31 J | 90.4 | <0.28 |
| A5C250021-017 | FMSONS27/6-12" | HASB-27 | 3/22/95 | <1.0 | 8.2 | <0.50 | <1.0 | 5.1 | 5.8 | 30.0 | 6.5 | <30.0 J | 9.6 | 129 | 2.6 | 19.6 | 0.12 | W <0.50 J | <1.0 | <100 | 27 J | 91.0 | <0.27 |
| A5C250021-018 | FMSONS51/6-12" | HASB-27(DUP) | 3/22/95 | <1.0 | 5.5 | <0.50 | <1.0 | 5.1 | 8.2 | 16.2 | 6.4 | <30.0 J | 9.8 | 95.8 | 2.2 | 11.6 | <0.10 | W <0.50 J | <1.0 | <100 | 23 J | 93.1 | <0.27 |
| A5C250021-016 | FMSONS28/6-12" | HASB-28 | 3/22/95 | <1.0 | 8.1 | <0.50 | <1.0 | <5.0 | 3.5 | 175 | 5.8 | <30.0 J | 5.9 | 210 | 1.2 | 128 | <0.10 | W <0.50 J | <1.0 | <100 | 93 J | 87.5 | <0.29 |
| A5C250021-019 | FMSONS29/6-12" | HASB-29 | 3/22/95 | <1.0 | 7.1 | <0.50 | <1.0 | 5.8 | 5.4 | 5.2 | 4.3 | <30.0 J | 9.4 | 17.3 | 2.0 | 5.9 | <0.10 | W <0.50 J | <1.0 | <100 | 270 J | 82.7 | <0.30 |
| A5C250021-020 | FMSONS30/6-12" | HASB-30 | 3/22/95 | <1.0 | 10.3 | <0.50 | <1.0 | 10.1 | 12.8 | 21.1 | 11.4 | <30.0 J | 11.4 | 33.8 | 3.1 | 9.2 | <0.10 | W <0.50 J | <1.0 | <100 | <23 UJ | 87.6 | <0.29 |
| A5D200054-011 | FMSONS31/1-3' | SB-31 | 4/18/95 | <1.0 | 12.6 J | <0.50 | <1.0 | 12.8 | 27.6 | 19.4 J | 18.5 J | <30.0 | 10.4 | 46.3 J | 3.7 | 25.5 | <0.50 | <0.50 J | <1.0 | <100 | <23 UJ | 86.5 | <0.29 J |
| A5D200054-013 | FMGWMWG | EQUIPMENT BLANK | 4/18/95 | <10.0 | <10.0 | <5.0 | <10.0 | <50.0 | <20.0 | <10.0 | <40.0 | <300 | <50.0 | <50.0 | <5.0 | 16.1 | <0.20 | <5.0 | <10.0 | <1,000 | <1.2 J | NA | <0.005 J |
| A5C250021-006 | FMSONS32/1.5-2' | SB-32 | 3/24/95 | <1.0 | 19.4 | <0.50 | <1.0 | 8.1 | 6.9 | 7.3 | 5.6 | <30.0 J | 6.5 | 14.8 | 5.8 | 5.1 | <0.10 | W <0.50 J | <1.0 | <100 | 31 J | 86.2 | <0.29 |
| A5C250021-005 | FMSONS33/2-2.5' | SB-33 | 3/24/95 | <1.0 | 5.8 | <.50 | <1.0 | 7.1 | 6.5 | 11.4 | 4.5 | <30.0 J | 6.2 | 12.7 | 2.2 | 4.8 | <.10 | W <.50 J | <1.0 | <100 | 43 J | 84.8 | <0.29 |
| A5C250021-004 | FMSONS34/2-2.5' | SB-34 | 3/24/95 | <1.0 | 5.7 | <0.50 | <1.0 | <5.0 | 4.7 | 9.9 | 4.4 | <30.0 J | 6.7 | 19.1 | 2.7 | 5.3 | <0.10 | W <0.50 J | <1.0 | <100 | <23 UJ | 85.3 | <0.29 |
| A5D200054-010 | FMSONS35/1-3' | SB-35 | 4/18/95 | <1.0 | 5.3 J | <0.50 | <1.0 | <5.0 | 6.6 | 25.8 J | 6.1 J | <30.0 | 10.2 | 34.9 UB | 2 | 6.4 UB | <0.50 | <0.50 J | <1.0 | <100 | <24 J | 84.4 | <0.30 J |
| A5D200054-009 | FMSONS36/1-3' | SB-36 | 4/18/95 | <1.0 | 14.8 J | <0.50 | <1.0 | 11.7 | 43.0 | 42.5 J | 25.0 J | <30.0 | 10.6 | 146 J | 9.5 | 56.1 | <0.50 | <1.0 J | <1.0 | <100 | <22 J | 91.0 | <0.27 J |

NOTES:

NA - NOT ANALYZED

B - (COMPOUND DETECTED IN METHOD BLANK ASSOCIATED WITH THIS SAMPLE)

MS/MSD - MATRIX SPIKE/MATRIX SPIKE DUPLICATE

+ - SAMPLE RESULTS DETERMINED BY THE METHOD OF STANDARD ADDITIONS AND THE CORRELATION COEFFICIENT WAS LESS THAN 0.995.

W - POST DIGESTION SPIKE FELL BETWEEN 40-85% WHILE THE SAMPLE RESULT WAS LESS THAN ONE-HALF THE REPORTING LIMIT.

S - SAMPLE RESULT DETERMINED BY THE METHOD OF STANDARD ADDITIONS.

HASB - HAND-AUGERED SOIL BORING

SB - SOIL BORING

- WATER SAMPLES, MEASURED IN ug/L.

- EQUIPMENT BLANK

J - ESTIMATED VALUE

UJ - ESTIMATED VALUE ( NOT DETECTED).

R - UNUSABLE (NOT DETECTED).

U - NOT DETECTED.



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Table 4-5. Soil Analytical Results, SWMUs #4,#5,#6, and #7, Near Surface Soil Sampling, Federated Metals, Hammond, Indiana.

PARAMETER
Semi-Volatiles

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Acenapthene | Acenaphthylene | Acetophenone | 2-Acetylaminofluorene | 4-Aminobiphenyl | Aniline | Anthracene | Aramite, Total | Benzo (a) anthracene | Benzo (b) fluoranthene | Benzo (k) fluoranthene | Benzo (g,h,i) perylene | Benzo (a) pyrene | Benzyl alcohol | bis(2-Chloroisopropyl)ether | bis(2-Ethylhexyl)phthalate | 4-Bromophenyl phenyl ether | Butyl benzyl phthalate | 2-sec-Butyl-4,6-dinitro-phenol | 4-Chloroaniline | p-Chlorobenzilate | bis (2-Chloroethoxy) methane | bis(2-Chloroethyl)ether | bis(2-Chloro-1-methylethyl) ether | 4-Chloro-3-methylphenol | 2-Chloronaphthalene | 2-Chlorophenol | 4-Chlorophenyl phenyl ether | Chrysene | Diallate | Dibenz(a,h)anthracene | Dibenzofuran |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5C250021-010 | FMSONS11/5.5-6' | SB-11 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-027 | FMSONS12/4.5-5' | SB-12 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-011 | FMSONS13/5.5-6' | SB-13 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-004 | FMSONS17/3-5' | SB-17 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-006 | FMSONS20/3-5' | SB-20 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-005 | FMSONS23/1-3' | SB-23 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-008 | FMSONS24/1-3' | SB-24 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-007 | FMGWMWF | EQUPMENT BLANK | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

PARAMETER
Semi-Volatiles (Continued)

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Di-n-butyl phthalate | 1,2-Dichlorobenzene | 1,3-Dichlorobenzene | 1,4-Dichlorobenzene | 3,3'-Dichlorobenzidine | 2,4-Dichlorophenol | 2,6-Dichlorophenol | Diethyl phthalate | Dimethoate | p-(Dimethylamino)azobenzene | Disulfoton | 7,12-Dimethylbenz(a)-anthracene | 3,3'-Dimethylbenzidine | a,a-Dimethylphenethylamine | 2,4-Dimethylphenol | alpha,alpha-Dimethyl phenethyl | Dimethyl phthalate | 1,3-Dinitrobenzene | 4,6-Dinitro-2-methylphenol | 2,4-Dinitrophenol | 2,4-Dinitrotoluene | 2,6-Dinitrotoluene | Di-n-octyl phthalate | Diphenylamine | bis(2-Ethylhexyl) phthalate | Ethyl methanesulfonate | Famphur | Fluoranthene | Fluorene | Hexachlorobenzene | Hexachlorobutadiene | Hexachlorocyclopentadiene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5C250021-010 | FMSONS11/5.5-6' | SB-11 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-027 | FMSONS12/4.5-5' | SB-12 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-011 | FMSONS13/5.5-6' | SB-13 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-004 | FMSONS17/3-5' | SB-17 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-006 | FMSONS20/3-5' | SB-20 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-005 | FMSONS23/1-3' | SB-23 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-008 | FMSONS24/1-3' | SB-24 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-007 | FMGWMWF | EQUPMENT BLANK | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

NOTES:
J - ESTIMATED VALUE
B - (COMPOUND DETECTED IN METHOD BLANK ASSOCIATED WITH THIS SAMPLE)
MS/MSD - MATRIX SPIKE/MATRIX SPIKE DUPLICATE
+ - SAMPLE RESULTS DETERMINED BY THE METHOD OF STANDARD ADDITIONS AND THE CORRELATION COEFFICIENT WAS LESS THAN 0.995.
W - POST DIGESTION SPIKE FELL BETWEEN 40-85% WHILE THE SAMPLE RESULT WAS LESS THAN ONE-HALF THE REPORTING LIMIT.

S - SAMPLE RESULT DETERMINED BY THE METHOD OF STANDARD ADDITIONS.
HASB - HAND-AUGERED SOIL BORING
SB - SOIL BORING
-EQUIPMENT BLANK
- WATER SAMPLES, MEASURED IN ug/L.
NA - NOT ANALYZED.



GERAGHTY & MILLER, INC

Table 4-5. Soil Analytical Results, SWMUs #4,#5,#6, and #7, Near Surface Soil Sampling, Federated Metals, Hammond, Indiana.

| | | | | PARAMETER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Semi-Volatiles (Continued) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Hexachloroethane | Hexachlorophene | Hexachloropropene | Indeno(1,2,3-cd)pyrene | Isophorone | Isosafrole, Total | Methapyrilene | 3-Methylcholanthrene | Methyl methanesulfonate | 2-Methylnaphthalene | Naphthalene | 1,4-Naphthoquinone | 1-Naphthylamine | 2-Naphthylamine | 2-Nitroaniline | 3-Nitroaniline | 4-Nitroaniline | Nitrobenzene | 4-Nitroquinoline-1-oxide | N-Nitrosodi-n-butylamine | N-Nitrosodiethylamine | N-Nitrosodimethylamine | N-Nitrosodiphenylamine | N-Nitrosodi-n-propylamine | N-Nitrosomethylethylamine | N-Nitrosomorpholine | N-Nitrosopiperidine | N-Nitrosopyrrolidine | 5-Nitro-o-toluidine | Pentachlorobenzene | Pentachloroethane |
| A5C250021-010 | FMSONS11/5.5-6' | SB-11 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-027 | FMSONS12/4.5-5' | SB-12 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-011 | FMSONS13/5.5-6' | SB-13 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-004 | FMSONS17/3-5' | SB-17 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-006 | FMSONS20/3-5' | SB-20 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-005 | FMSONS23/1-3' | SB-23 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-008 | FMSONS24/1-3' | SB-24 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-007 | FMGWMWF | EQUPMENT BLANK | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

| | | | | PARAMETER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Semi-Volatiles (Continued) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Pentachloronitrobenzene | Phenacetin | Phenanthrene | p-Phenylene diamine | Phorate | 2-Picoline | Pronamide | Pyrene | Pyridine | Safrole, Total | 1,2,4,5-Tetrachlorobenzene | Tetraethyldithiopyro-phosphate | o-Toluidine | 1,2,4-Trichlorobenzene | O,O,O-Triethyl phosphoro-thioate | 1,3,5-Trinitrobenzene | o-Cresol | m-Cresol | p-Cresol | 2-Methylphenol | 3-Methylphenol | 4-Methylphenol | Dinoseb | 2-Nitrophenol | 4-Nitrophenol | Pentachlorophenol | Phenol | 2,3,4,6-Tetrachlorophenol | Thionazin | 2,4,5-Trichlorophenol | 2,4,6-Trichlorophenol |
| A5C250021-010 | FMSONS11/5.5-6' | SB-11 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-027 | FMSONS12/4.5-5' | SB-12 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5C250021-011 | FMSONS13/5.5-6' | SB-13 | 3/23/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-004 | FMSONS17/3-5' | SB-17 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | |
| A5D200054-006 | FMSONS20/3-5' | SB-20 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-005 | FMSONS23/1-3' | SB-23 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-008 | FMSONS24/1-3' | SB-24 | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-007 | FMGWMWF | EQUPMENT BLANK | 4/18/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

NOTES:

J - ESTIMATED VALUE

B - (COMPOUND DETECTED IN METHOD BLANK ASSOCIATED WITH THIS SAMPLE)

MS/MSD - MATRIX SPIKE/MATRIX SPIKE DUPLICATE

+ - SAMPLE RESULTS DETERMINED BY THE METHOD OF STANDARD ADDITIONS AND THE CORRELATION COEFFICIENT WAS LESS THAN 0.995.

W - POST DIGESTION SPIKE FELL BETWEEN 40-85% WHILE THE SAMPLE RESULT WAS LESS THAN ONE-HALF THE REPORTING LIMIT.

S - SAMPLE RESULT DETERMINED BY THE METHOD OF STANDARD ADDITIONS.

HASB - HAND-AUGERED SOIL BORING

SB - SOIL BORING

-EQUIPMENT BLANK

- WATER SAMPLES, MEASURED IN ug/L.

NA - NOT ANALYZED.



GERAGHTY & MILLER, INC.

Table 4-5. Soil Analytical Results, SWMUs #4,#5,#6, and #7, Near Surface Soil Sampling, Federated Metals, Hammond, Indiana.

| | | | | PARAMETER Metals Results in mg/kg | | | | | | | | | | | | | | | | | PARAMETER Fluoride, Total Solids, Total Cyanide, Results in mg/kg | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Silver | Barium | Beryllium | Cadmium | Cobalt | Chromium | Copper | Nickel | Antimony | Vanadium | Zinc | Arsenic | Lead | Mercury | Selenium | Thallium | Tin | Fluoride | Solids, Total(TS) | Cyanide, Total |
| A5C250021-010 | FMSONS11/5.5-6' | SB-11 | 3/23/95 | <1.0 | 4.8 J | <0.50 | 12.2 | <5.0 | 3.5 | 18 | 9.3 | <30.0 J | 5.4 | 573 | 2.8 J | 22 | <0.10 | 0.91 J | <1.0 | <100 | 46 J | 82.9 | <0.30 |
| A5C250021-027 | FMSONS12/4.5-5' | SB-12 | 3/23/95 | 5.9 | 2,100 | <0.50 | 20 | 11.6 | 24.1 | 15,400 | 182 | 73.6 | 20.7 | 26,700 | 25.1 | 36,000 | 1.5 | 2.5 J | <1.0 | 2,920 | 130 J | 82.0 | <0.30 |
| A5C250021-011 | FMSONS13/5.5-6' | SB-13 | 3/23/95 | <1.0 | 4.2 | <0.50 | 2.4 | <5.0 | 3.2 | 14.6 | 95.6 J | <30 J | 5.2 | 1,410 | 1.4 | 6.7 | <0.10 | S <0.50 J | <1.0 | <100 | <25 UJ | 80.9 | <0.31 |
| A5D200054-004 | FMSONS17/3-5' | SB-17 | 4/18/95 | <.1.0 | 4.6 J | <0.50 | <1.0 | 5.1 | 5.2 | 20.1 J | 6.4 UB | <30.0 | 5.4 | 35.9 UB | 3.4 | 7.8 UB | <0.50 | <0.50 J | <1.0 | <100 | <26 UJ | 78.1 | <0.32 J |
| A5D200054-006 | FMSONS20/3-5' | SB-20 | 4/18/95 | <1.0 | 56.1 J | 1.1 UB | 2.6 J | <5.0 | 113.0 | 505 J | 35.2 J | 36.2 | 32.7 | 987 J | 7.5 | 881 | <0.50 | <0.50 J | <1.0 | 152 J | <24 UJ | 83.9 | <0.30 J |
| A5D200054-005 | FMSONS23/1-3' | SB-23 | 4/18/95 | 7.7 | 402 J | 6.9 | 118 J | 13.0 | 45.9 | 8830 J | 474 J | 6,560 | 13.9 | 17100 J | 189 | 30,300 | 2.9 | 6.1 J | 1.1 | 4670 J | <24 UJ | 83.6 | <0.30 J |
| A5D200054-008 | FMSONS24/1-3' | SB-24 | 4/18/95 | <1.0 | 4.6 J | <0.50 | <1.0 | <5.0 | 3.6 | 13.6 UB | <4.0 | <30.0 | <5.0 | 40.1 UB | 1.4 J | 9.8 UB | <0.50 | <0.50 J | <1.0 | <100 | <24 UJ | 85.1 | <0.29 J |
| A5D200054-007 | FMGWMWF | EQUPMENT BLANK | 4/18/95 | <10.0 | <10.0 | <5.0 | <10.0 | <50.0 | <20.0 | 17.0 | <40.0 | <300 | <50.0 | <50.0 | <5.0 | 18.2 | <0.64 | <5.0 | <10.0 | <1,000 | <1.2 UJ | NA | <0.005 J |

NOTES:

J - ESTIMATED VALUE

B - (COMPOUND DETECTED IN METHOD BLANK ASSOCIATED WITH THIS SAMPLE)

MS/MSD - MATRIX SPIKE/MATRIX SPIKE DUPLICATE

UJ - ESTIMATED (NOT DETECTED)

W - POST DIGESTION SPIKE FELL BETWEEN 40-85% WHILE THE SAMPLE RESULT WAS LESS THAN ONE-HALF THE REPORTING LIMIT.

S - SAMPLE RESULT DETERMINED BY THE METHOD OF STANDARD ADDITIONS.

HASB - HAND-AUGERED SOIL BORING

SB - SOIL BORING

-EQUIPMENT BLANK

- WATER SAMPLES, MEASURED IN ug/L.

NA - NOT ANALYZED.



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Table 4-6. Soil Analytical Results, SWMU #9 Near Surface Soil Sampling, Federated Metals, Hammond, Indiana.

PARAMETER
Semi-Volatiles

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Acenapthene | Acenaphthylene | Acetophenone | 2-Acetylaminofluorene | 4-Aminobiphenyl | Aniline | Anthracene | Aramite, Total | Benzo (a) anthracene | Benzo (b) fluoranthene | Benzo (k) fluoranthene | Benzo (g,h,i) perylene | Benzo (a) pyrene | Benzyl alcohol | bis(2-Chloroisopropyl)ether | bis(2-Ethylhexyl)phthalate | 4-Bromophenyl phenyl ether | Butyl benzyl phthalate | 2-sec-Butyl-4,6-dinitro-phenol | 4-Chloroaniline | p-Chlorobenzilate | bis (2-Chloroethoxy) methane | bis(2-Chloroethyl)ether | bis(2-Chloro-1-methylethyl) ether | 4-Chloro-3-methylphenol | 2-Chloronaphthalene | 2-Chlorophenol | 4-Chlorophenyl phenyl ether | Chrysene | Diallate | Dibenz(a,h)anthracene | Dibenzofuran |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5D200054-019 | FMSOSB7/5-7' | SB-7 | 4/19/95 | <420 | <420 | <420 | <840 | <2,000 | <420 | <420 | NA | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | NA | <420 | <420 | <420 | <420 | NA | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 |
| A5D200054-014 | FMSOSB8/5-7' (MS/MSD) | SB-8 | 4/19/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-015 | FMSOSB8/7-8' (MS/MSD) | SB-8 | 4/19/95 | <430 | <430 | <430 | <850 | <2,100 | <430 | <430 | NA | 47 J | <430 | <430 | <430 | <430 | <430 | <430 | <430 | <430 | <430 | NA | <430 | <430 | <430 | <430 | NA | <430 | <430 | <430 | <430 | 81 J | <430 | <430 | <430 |
| A5D200054-017 | FMSOSB9/4-6' | SB-9 | 4/19/95 | <410 | <410 | <410 | <830 | <2,000 | <410 | <410 | NA | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | NA | <410 | <410 | <410 | <410 | NA | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 |
| A5D200054-018 | FMSOSB55/4-6' | SB-9 (DUP) | 4/19/95 | 47 J | <400 | <400 | <800 | <1,900 | <400 | <400 | NA | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | NA | <400 | <400 | <400 | <400 | NA | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 |

PARAMETER
Semi-Volatiles (Continued)

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Di-n-butyl phthalate | 1,2-Dichlorobenzene | 1,3-Dichlorobenzene | 1,4-Dichlorobenzene | 3,3'-Dichlorobenzidine | 2,4-Dichlorophenol | 2,6-Dichlorophenol | Diethyl phthalate | Dimethoate | p-(Dimethylamino)azobenzene | Disulfoton | 7,12-Dimethylbenz(a)-anthracene | 3,3'-Dimethylbenzidine | a,a-Dimethylphenethylamine | 2,4-Dimethylphenol | alpha,alpha-Dimethyl phenethyl | Dimethyl phthalate | 1,3-Dinitrobenzene | 4,6-Dinitro-2-methylphenol | 2,4-Dinitrophenol | 2,4-Dinitrotoluene | 2,6-Dinitrotoluene | Di-n-octyl phthalate | Diphenylamine | bis(2-Ethylhexyl) phthalate | Ethyl methanesulfonate | Famphur | Fluoranthene | Fluorene | Hexachlorobenzene | Hexachlorobutadiene | Hexachlorocyclopentadiene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5D200054-019 | FMSOSB7/5-7' | SB-7 | 4/19/95 | <420 | <420 | <420 | <420 | <840 | <420 | <420 | <420 | <8,400 J | <840 | <420 | <4,200 | <2,000 | 2,000 J | <420 | <2,000 | <420 | <420 | <2,000 | <2,000 | <420 | <420 | <420 | <420 | NA | <420 | <4,200 J | <420 | <420 | <420 | <420 | <420 |
| A5D200054-014 | FMSOSB8/5-7' (MS/MSD) | SB-8 | 4/19/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-015 | FMSOSB8/7-8' (MS/MSD) | SB-8 | 4/19/95 | <430 | <430 | <430 | <430 | <850 | <430 | <430 | <430 | <8,500 J | <850 | <430 | <4,300 | <2,100 | 2,100 J | <430 | <2,100 | <430 | <430 | <2,100 | <2,100 | <430 | <430 | <430 | <430 | NA | <430 | <4,300 J | <430 | <430 | <430 | <430 | <430 |
| A5D200054-017 | FMSOSB9/4-6' | SB-9 | 4/19/95 | <410 | <410 | <410 | <410 | <830 | <410 | <410 | <410 | <8,300 J | <830 | <410 | <4,100 | <2,000 | 2,000 J | <410 | <2,000 | <410 | <410 | <2,000 | <2,000 | <410 | <410 | <410 | <410 | NA | <410 | <4,100 J | <410 | <410 | <410 | <410 | <410 |
| A5D200054-018 | FMSOSB55/4-6' | SB-9 (DUP) | 4/19/95 | <400 | <400 | <400 | <400 | <800 | <400 | <400 | <400 | <8,000 J | <800 | <400 | <4,000 | <1,900 | 1,900 J | <400 | <1,900 | <400 | <400 | <1,900 | <1,900 | <400 | <400 | <400 | <400 | NA | <400 | <4,000 J | <400 | <400 | <400 | <400 | <400 |

NOTES:
NA - NOT ANALYZED.
B - (COMPOUND DETECTED IN METHOD BLANK ASSOCIATED WITH THIS SAMPLE)
MS/MSD - MATRIX SPIKE/MATRIX SPIKE DUPLICATE
+ - SAMPLE RESULTS DETERMINED BY THE METHOD OF STANDARD ADDITIONS AND THE CORRELATION COEFFICIENT WAS LESS THAN 0.995.
W - POST DIGESTION SPIKE FELL BETWEEN 40-85% WHILE THE SAMPLE RESULT WAS LESS THAN ONE-HALF THE REPORTING LIMIT.

S - SAMPLE RESULT DETERMINED BY THE METHOD OF STANDARD ADDITIONS.
HASB - HAND-AUGERED SOIL BORING
SB - SOIL BORING
- EQUIPMENT BLANK
- WATER SAMPLES, MEASURED IN ug/L.

J - ESTIMATED VALUE
UJ - ESTIMATED VALUE ( NOT DETECTED).
R - UNUSABLE (NOT DETECTED).
U - NOT DETECTED.

Table 4-6. Soil Analytical Results, SWMU #9 Near Surface Soil Sampling, Federated Metals, Hammond, Indiana.

| | | | | PARAMETER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Semi-Volatiles (Continued) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Hexachloroethane | Hexachlorophene | Hexachloropropene | Indeno(1,2,3-cd)pyrene | Isophorone | Isosafrole, Total | Methapyrilene | 3-Methylcholanthrene | Methyl methanesulfonate | 2-Methylnaphthalene | Naphthalene | 1,4-Naphthoquinone | 1-Naphthylamine | 2-Naphthylamine | 2-Nitroaniline | 3-Nitroaniline | 4-Nitroaniline | Nitrobenzene | 4-Nitroquinoline-1-oxide | N-Nitrosodi-n-butylamine | N-Nitrosodiethylamine | N-Nitrosodimethylamine | N-Nitrosodiphenylamine | N-Nitrosodi-n-propylamine | N-Nitrosomethylethylamine | N-Nitrosomorpholine | N-Nitrosopiperidine | N-Nitrosopyrrolidine | 5-Nitro-o-toluidine | Pentachlorobenzene | Pentachloroethane |
| A5D200054-019 | FMSOSB7/5-7' | SB-7 | 4/19/95 | <420 | NA | <4,200 | <420 | <420 | <420 | <4,200 | <1,900 | <420 | <420 | <420 | <8,400 J | <420 | <420 | <2,000 | <2,000 | <2,000 | <420 | <4,200 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <2,000 |
| A5D200054-014 | FMSOSB8/5-7' (MS/MSD) | SB-8 | 4/19/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-015 | FMSOSB8/7-8' (MS/MSD) | SB-8 | 4/19/95 | <430 | NA | <4,300 | <430 | <430 | <430 | <4,300 | <1,900 | <430 | <430 | <430 | <8,500 J | <430 | <430 | <2,100 | <2,100 | <2,100 | <430 | <4,300 | <430 | <430 | <430 | <430 | <430 | <430 | <430 | <430 | <430 | <430 | <430 | <2,100 |
| A5D200054-017 | FMSOSB9/4-6' | SB-9 | 4/19/95 | <410 | NA | <4,100 | <410 | <410 | <410 | <4,100 | <1,900 | <410 | <410 | <410 | <8,300 J | <410 | <410 | <2,000 | <2,000 | <2,000 | <410 | <4,100 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <2,000 |
| A5D200054-018 | FMSOSB55/4-6' | SB-9 (DUP) | 4/19/95 | <400 | NA | <4,000 | <400 | <400 | <400 | <4,000 | <1,800 | <400 | <400 | <400 | <8,000 J | <400 | <400 | <1,900 | <1,900 | <1,900 | <400 | <4,000 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <1,900 |

| | | | | PARAMETER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Semi-Volatiles (Continued) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Pentachloronitrobenzene | Phenacetin | Phenanthrene | p-Phenylene diamine | Phorate | 2-Picoline | Pronamide | Pyrene | Pyridine | Safrole, Total | 1,2,4,5-Tetrachlorobenzene | Tetraethyldithiopyro-phosphate | o-Toluidine | 1,2,4-Trichlorobenzene | O,O,O-Triethyl phosphoro-thioate | 1,3,5-Trinitrobenzene | o-Cresol | m-Cresol | p-Cresol | 2-Methylphenol | 3-Methylphenol | 4-Methylphenol | Dinoseb | 2-Nitrophenol | 4-Nitrophenol | Pentachlorophenol | Phenol | 2,3,4,6-Tetrachlorophenol | Thionazin | 2,4,5-Trichlorophenol | 2,4,6-Trichlorophenol |
| A5D200054-019 | FMSOSB7/5-7' | SB-7 | 4/19/95 | <2,000 | <2,000 | <420 | <2,000 J | <2,000 | <840 | <840 | <420 | <420 | <420 | <420 | <2,000 | <420 | <420 | <2,000 | <2,000 R | NA | NA | NA | <420 | <420 | <420 | <2,000 | <420 | <2,000 | <2,000 | <420 | <2,000 | NA | <420 | <420 |
| A5D200054-014 | FMSOSB8/5-7' (MS/MSD) | SB-8 | 4/19/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| A5D200054-015 | FMSOSB8/7-8' (MS/MSD) | SB-8 | 4/19/95 | <2,100 | <2,100 | <430 | <2,100 J | <2,100 | <850 | <850 | 95 J | <430 | <430 | <430 | <2,100 | <430 | <430 | <2,100 | <2,100 R | NA | NA | NA | <430 | <430 | <430 | <2,100 | <430 | <2,100 | <2,100 | <430 | <2,100 | NA | <430 | <430 |
| A5D200054-017 | FMSOSB9/4-6' | SB-9 | 4/19/95 | <2,000 | <2,000 | <410 | <2,000 J | <2,000 | <830 | <830 | 60 J | <410 | <410 | <410 | <2,000 | <410 | <410 | <2,000 | <2,000 R | NA | NA | NA | <410 | <410 | <410 | <2,000 | <410 | <2,000 | <2,000 | <410 | <2,000 | NA | <410 | <410 |
| A5D200054-018 | FMSOSB55/4-6' | SB-9 (DUP) | 4/19/95 | <1,900 | <1,900 | 120 J | <1,900 J | <1,900 | <800 | <800 | <400 | <400 | <400 | <400 | <1,900 | <400 | <400 | <1,900 | <1,900 R | NA | NA | NA | <400 | <400 | <400 | <1,900 | <400 | <1,900 | <1,900 | <400 | <1,900 | NA | <400 | <400 |

NOTES:

NA - NOT ANALYZED.

B - (COMPOUND DETECTED IN METHOD BLANK ASSOCIATED WITH THIS SAMPLE)

MS/MSD - MATRIX SPIKE/MATRIX SPIKE DUPLICATE

+ - SAMPLE RESULTS DETERMINED BY THE METHOD OF STANDARD ADDITIONS AND THE CORRELATION COEFFICIENT WAS LESS THAN 0.995.

W - POST DIGESTION SPIKE FELL BETWEEN 40-85% WHILE THE SAMPLE RESULT WAS LESS THAN ONE-HALF THE REPORTING LIMIT.

S - SAMPLE RESULT DETERMINED BY THE METHOD OF STANDARD ADDITIONS.

HASB - HAND-AUGERED SOIL BORING

SB - SOIL BORING

- EQUIPMENT BLANK

- WATER SAMPLES, MEASURED IN ug/L.

J - ESTIMATED VALUE

UJ - ESTIMATED VALUE ( NOT DETECTED).

R - UNUSABLE (NOT DETECTED).

U - NOT DETECTED.

GERAGHTY & MILLER, INC.

Table 4-6. Soil Analytical Results, SWMU #9 Near Surface Soil Sampling, Federated Metals, Hammond, Indiana.

| | | | | PARAMETER Metals Results in mg/kg | | | | | | | | | | | | | | | | | | PARAMETER Fluoride, Total Solids, Total Cyanide, Results in mg/kg | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Silver | Barium | Beryllium | Cadmium | Cobalt | Chromium | Copper | Nickel | Antimony | Vanadium | Zinc | Arsenic | Lead | Mercury | Selenium | Thallium | Tin | Fluoride | Solids, Total(TS) | Cyanide, Total |
| A5D200054-019 | FMSOSB7/5-7' | SB-7 | 4/19/95 | <1.0 | 5.5 J | <0.50 | <1.0 | <5.0 | 4.8 | 151 J | 5.0 J | <30.0 | 7.8 | 149 J | 1.6 | 40.2 | <0.50 | <0.50 J | <1.0 | <100 | <25 UJ | 78.9 | <0.32 |
| A5D200054-014 | FMSOSB8/5-7' (MS/MSD) | SB-8 | 4/19/95 | <1.0 | 19.2 J | <0.50 | <1.0 | <5.0 | 5.6 | 462 J | 13.7 J | <30.0 | 7.5 | 569 | 3.9 | 220 | <0.50 | <0.50 J | <1.0 | <100 | <25 UJ | 79.3 | <0.32 J |
| A5D200054-015 | FMSOSB8/7-8' (MS/MSD) | SB-8 | 4/19/95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 77.6 | NA |
| A5D200054-017 | FMSOSB9/4-6' | SB-9 | 4/19/95 | <1.0 | 20.4 J | <0.50 | 1.6 U | <5.0 | 5.5 | 638 J | 13.9 J | <30.0 | 7.9 | 876 J | 3.4 | 366 | <0.50 | <0.50 J | <1.0 | <100 | <25 UJ | 79.7 | <0.31 |
| A5D200054-018 | FMSOSB55/4-6' | SB-9 (DUP) | 4/19/95 | <1.0 | 24.0 J | <0.50 | 1.5 J | <5.0 | 7.5 | 803 J | 23.3 J | <30.0 | 8.4 | 1010 J | 3.5 | 388 | <0.50 | <0.50 J | <1.0 | 107 J | <25 UJ | 82.1 | <0.30 |

NOTES:

NA - NOT ANALYZED.

B - (COMPOUND DETECTED IN METHOD BLANK ASSOCIATED WITH THIS SAMPLE)

MS/MSD - MATRIX SPIKE/MATRIX SPIKE DUPLICATE

+ - SAMPLE RESULTS DETERMINED BY THE METHOD OF STANDARD ADDITIONS AND THE CORRELATION COEFFICIENT WAS LESS THAN 0.995.

W - POST DIGESTION SPIKE FELL BETWEEN 40-85% WHILE THE SAMPLE RESULT WAS LESS THAN ONE-HALF THE REPORTING LIMIT.

S - SAMPLE RESULT DETERMINED BY THE METHOD OF STANDARD ADDITIONS.

J - ESTIMATED VALUE

UJ - ESTIMATED VALUE ( NOT DETECTED).

R - UNUSABLE (NOT DETECTED).

U - NOT DETECTED.

HASB - HAND-AUGERED SOIL BORING

SB - SOIL BORING

- EQUIPMENT BLANK

- WATER SAMPLES, MEASURED IN ug/L.

GERAGHTY & MILLER, INC.

Table 4-7. Soil Analytical Results, SWMU #10 Near Surface Soil Sampling, Federated Metals, Hommond, Indiana.

**PARAMETER**
**Semi-Volatiles**

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Acenapthene | Acenaphthylene | Acetophenone | 2-Acetylaminofluorene | 4-Aminobiphenyl | Aniline | Anthracene | Aramite, Total | Benzo (a) anthracene | Benzo (b) fluoranthene | Benzo (k) fluoranthene | Benzo (g,h,i) perylene | Benzo (a) pyrene | Benzyl alcohol | bis(2-Chloroisopropyl)ether | bis(2-Ethylhexyl)phthalate | 4-Bromophenyl phenyl ether | Butyl benzyl phthalate | 2-sec-Butyl-4,6-dinitro-phenol | 4-Chloroaniline | p-Chlorobenzilate | bis (2-Chloroethoxy) methane | bis(2-Chloroethyl)ether | bis(2-Chloro-1-methylethyl) ether | 4-Chloro-3-methylphenol | 2-Chloronaphthalene | 2-Chlorophenol | 4-Chlorophenyl phenyl ether | Chrysene | Dialiate | Dibenz(a,h)anthracene | Dibenzofuran |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5D200054-021 | FMGMMWH | EQUIPMENT BLANK | 4/19/95 | <10 | <10 | <10 | <20 | <50 | <10 | <10 | NA | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | NA | <10 | <10 | <10 | <10 | NA | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| A5F170015-003 | FMSOSB4/3-5 | SB-4 | 6/15/95 | 9,300 | <8,300 | <8,300 | <17,000 | <40,000 | <8,300 | 24,000 | NA | 5,700 J | 990 J | <8,300 | 1,100 J | 3,100 J | <8,300 | <8,300 | <8,300 | <8,300 | <8,300 | NA | <8,300 | <8,300 | <8,300 | <8,300 | NA | <8,300 | <8,300 | <8,300 | <8,300 | 6,600 J | <8,300 | <8,300 | 14,000 |
| A5F170015-004 | FMSOSB4/5-7 | SB-4 | 6/15/95 | <400 | <400 | <400 | <800 | <1,900 | <400 | 110 J | NA | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | NA | <400 | <400 | <400 | <400 | NA | <400 | <400 | <400 | <400 | <400 | <400 | <400 | 57 J |
| A5F170015-001 | FMSOSB5/1-3 | SB-5 | 6/15/95 | <420 | <420 | <420 | <840 | <2,000 | <420 | <420 | NA | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | NA | <420 | <420 | <420 | <420 | NA | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 |
| A5F170015-002 | FMSOSB5/5-7 | SB-5 | 6/15/95 | <400 | <400 | <400 | <800 | <1,900 | <400 | <400 | NA | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | NA | <400 | <400 | <400 | <400 | NA | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 |
| A5D200054-020 | FMSOSB6/5-7' | SB-6 | 4/19/95 | <420 | <420 | <420 | <840 | <2,000 | <420 | <420 | NA | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | NA | <420 | <420 | <420 | <420 | NA | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 |
| A5D200054-022 | FMSOSB6/1-3' | SB-6 | 4/19/95 | <400 | <400 | <400 | <810 | <2,000 | <400 | <400 | NA | <400 | 42 J | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | NA | <400 | <400 | <400 | <400 | NA | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 |

**PARAMETER**
**Semi-Volatiles (Continued)**

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Di-n-butyl phthalate | 1,2-Dichlorobenzene | 1,3-Dichlorobenzene | 1,4-Dichlorobenzene | 3,3'-Dichlorobenzidine | 2,4-Dichlorophenol | 2,6-Dichlorophenol | Diethyl phthalate | Dimethoate | p-(Dimethylamino)azobenzene | Disulfoton | 7,12-Dimethylbenz(a)-anthracene | 3,3'-Dimethylbenzidine | a,a-Dimethylphenethylamine | 2,4-Dimethylphenol | alpha,alpha-Dimethyl phenethyl | Dimethyl phthalate | 1,3-Dinitrobenzene | 4,6-Dinitro-2-methylphenol | 2,4-Dinitrophenol | 2,4-Dinitrotoluene | 2,6-Dinitrotoluene | Di-n-octyl phthalate | Diphenylamine | bis(2-Ethylhexyl) phthalate | Ethyl methanesulfonate | Famphur | Fluoranthene | Fluorene | Hexachlorobenzene | Hexachlorobutadiene | Hexachlorocyclopentadiene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5D200054-021 | FMGMMWH | EQUIPMENT BLANK | 4/19/95 | <10 | <10 | <10 | <10 | <20 | <10 | <10 | <10 | <200 | <20 | <10 | <100 | <50 | NA | <10 | <50 J | <10 | <10 | <50 | <50 | <10 | <10 | <10 | <10 | NA | <10 | <100 | <10 | <10 | <10 | <10 | <10 |
| A5F170015-003 | FMSOSB4/3-5 | SB-4 | 6/15/95 | <8,300 | <8,300 | <8,300 | <8,300 | <17,000 | <8,300 | <8,300 | <8,300 | <170,000 | <17,000 | NA | <83,000 | <40,000 | NA | <8,300 | <40,000 | <8,300 | <8,300 | <40,000 | <40,000 | <8,300 | <8,300 | <8,300 | <8,300 | NA | <8,300 | <83,000 | 4,800 J | 18,000 | <8,300 | <8,300 | <8,300 |
| A5F170015-004 | FMSOSB4/5-7 | SB-4 | 6/15/95 | 150 J | <400 | <400 | <400 | <800 | <400 | <400 | <400 | <8,000 | <800 | <400 | <4,000 | <1,900 | NA | <400 | <1,900 | <400 | <400 | <1,900 | <1,900 | <400 | <400 | <400 | <400 | NA | <400 | <4,000 | <400 | 74 J | <400 | <400 | <400 |
| A5F170015-001 | FMSOSB5/1-3 | SB-5 | 6/15/95 | 440 | <420 | <420 | <420 | <840 | <420 | <420 | <420 | <8,400 | <840 | <420 | <4,200 | <2,000 | NA | <420 | <2,000 | <420 | <420 | <2,000 | <2,000 | <420 | <420 | <420 | <420 | NA | <420 | <4,200 | <420 | <420 | <420 | <420 | <420 |
| A5F170015-002 | FMSOSB5/5-7 | SB-5 | 6/15/95 | 460 | <400 | <400 | <400 | <800 | <400 | <400 | <400 | <8,000 | <800 | <400 | <4,000 | <1,900 | NA | <400 | <1,900 | <400 | <400 | <1,900 | <1,900 | <400 | <400 | <400 | <400 | NA | <400 | <4,000 | <400 | <400 | <400 | <400 | <400 |
| A5D200054-020 | FMSOSB6/5-7' | SB-6 | 4/19/95 | <420 | <420 | <420 | <420 | <840 | <420 | <420 | <420 | <8,400 J | <840 | <420 | <4,200 | <2,000 | NA | <420 | <2,000 J | <420 | <420 | <2,000 | <2,000 | <420 | <420 | <420 | <420 | NA | <420 | <4,200 | <420 | <420 | <420 | <420 | <420 |
| A5D200054-022 | FMSOSB6/1-3' | SB-6 | 4/19/95 | <400 | <400 | <400 | <400 | <810 | <400 | <400 | <400 | <8,100 J | <810 | <400 | <4,000 | <2,000 | NA | <400 | <2,000 J | <400 | <400 | <2,000 | <2,000 | <400 | <400 | <400 | <400 | NA | <400 | <4,000 | <400 | <400 | <400 | <400 | <400 |

NOTES:
NA - NOT ANALYZED.
B - (COMPOUND DETECTED IN METHOD BLANK ASSOCIATED WITH THIS SAMPLE)
MS/MSD - MATRIX SPIKE/MATRIX SPIKE DUPLICATE
+ - SAMPLE RESULTS DETERMINED BY THE METHOD OF STANDARD ADDITIONS AND THE CORRELATION COEFFICIENT WAS LESS THAN 0.995.
W - POST DIGESTION SPIKE FELL BETWEEN 40-85% WHILE THE SAMPLE RESULT WAS LESS THAN ONE-HALF THE REPORTING LIMIT.
S - SAMPLE RESULT DETERMINED BY THE METHOD OF STANDARD ADDITIONS.

HASB - HAND-AUGERED SOIL BORING
SB - SOIL BORING
- EQUIPMENT BLANK
- WATER SAMPLES, MEASURED IN ug/L.

J - ESTIMATED VALUE
UJ - ESTIMATED VALUE ( NOT DETECTED).
R - UNUSABLE (NOT DETECTED).
U - NOT DETECTED.

GERAGHTY & MILLER, INC.

Table 4-7. Soil Analytical Results, SWMU #10 Near Surface Soil Sampling, Federated Metals, Hommond, Indiana.

PARAMETER
Semi-Volatiles (Continued)

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Hexachloroethane | Hexachlorophene | Hexachloropropene | Indeno(1,2,3-cd)pyrene | Isophorone | Isosafrole, Total | Methapyrilene | 3-Methylcholanthrene | Methyl methanesulfonate | 2-Methylnaphthalene | Naphthalene | 1,4-Naphthoquinone | 1-Naphthylamine | 2-Naphthylamine | 2-Nitroaniline | 3-Nitroaniline | 4-Nitroaniline | Nitrobenzene | 4-Nitroquinoline-1-oxide | N-Nitrosodi-n-butylamine | N-Nitrosodiethylamine | N-Nitrosodimethylamine | N-Nitrosodiphenylamine | N-Nitrosodi-n-propylamine | N-Nitrosomethylethylamine | N-Nitrosomorpholine | N-Nitrosopiperidine | N-Nitrosopyrrolidine | 5-Nitro-o-toluidine | Pentachlorobenzene | Pentachloroethane |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5D200054-021 | FMGMMWH | EQUIPMENT BLANK | 4/19/95 | <10 | NA | <100 | <10 | <10 | <10 | <100 | <100 | <10 | <100 | <10 | <200 J | <10 | <10 | <50 | <50 | <50 | <10 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <50 |
| A5F170015-003 | FMSOSB4/3-5 | SB-4 | 6/15/95 | <8,300 | NA | <83,000 | <8,300 | <8,300 | <8,300 | <83,000 | <38,000 | <8,300 | <8,300 | 1,300 J | <170,000 | <8,300 | <8,300 | <40,000 | <40,000 | <40,000 | <8,300 | <83,000 | <8,300 | <8,300 | <8,300 | <8,300 | <8,300 | <8,300 | <8,300 | <8,300 | <8,300 | <8,300 | <8,300 | <40,000 |
| A5F170015-004 | FMSOSB4/5-7 | SB-4 | 6/15/95 | <400 | NA | <4,000 | <400 | <400 | <400 | <4,000 | <1,800 | <400 | <400 | <400 | <8,000 | <400 | <400 | <1,900 | <1,900 | <1,900 | <400 | <4,000 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <1,900 |
| A5F170015-001 | FMSOSB5/1-3 | SB-5 | 6/15/95 | <420 | NA | <4,200 | <420 | <420 | <420 | <4,200 | <1,900 | <420 | <420 | <420 | <8,400 | <420 | <420 | <2,000 | <2,000 | <2,000 | <420 | <4,200 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <2,000 |
| A5F170015-002 | FMSOSB5/5-7 | SB-5 | 6/15/95 | <400 | NA | <4,000 | <400 | <400 | <400 | <4,000 | <1,800 | <400 | <400 | <400 | <8,000 | <400 | <400 | <1,900 | <1,900 | <1,900 | <400 | <4,000 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <1,900 |
| A5D200054-020 | FMSOSB6/5-7' | SB-6 | 4/19/95 | <420 | NA | <4,200 | <420 | <420 | <420 | <4,200 | <1,900 | <420 | <420 | <420 | <8,400 J | <420 | <420 | <2,000 | <2,000 | <2,000 | <420 | <4,200 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <2,000 |
| A5D200054-022 | FMSOSB6/1-3' | SB-6 | 4/19/95 | <400 | NA | <4,000 | <400 | <400 | <400 | <4,000 | <1,800 | <400 | <400 | <400 | <8,100 J | <400 | <400 | <2,000 | <2,000 | <2,000 | <400 | <4,000 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <2,000 |

PARAMETER
Semi-Volatiles (Continued)

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Pentachloronitrobenzene | Phenacetin | Phenanthrene | p-Phenylene diamine | Phorate | 2-Picoline | Pronamide | Pyrene | Pyridine | Safrole, Total | 1,2,4,5-Tetrachlorobenzene | Tetraethyldithiopyro-phosphate | o-Toluidine | 1,2,4-Trichlorobenzene | O,O,O-Triethyl phosphoro-thioate | 1,3,5-Trinitrobenzene | o-Cresol | m-Cresol | p-Cresol | 2-Methylphenol | 3-Methylphenol | 4-Methylphenol | Dinoseb | 2-Nitrophenol | 4-Nitrophenol | Pentachlorophenol | Phenol | 2,3,4,6-Tetrachlorophenol | Thionazin | 2,4,5-Trichlorophenol | 2,4,6-Trichlorophenol |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5D200054-021 | FMGMMWH | EQUIPMENT BLANK | 4/19/95 | <50 | <50 | <10 | <50 | <50 | <20 | <20 | <10 | <10 | <10 | <10 | <50 | <10 | <10 | <50 | <50 R | NA | NA | NA | <10 | <10 | <10 | <50 | <10 | <50 | <50 | <10 | <50 | NA | <10 | <10 |
| A5F170015-003 | FMSOSB4/3-5 | SB-4 | 6/15/95 | <40,000 | <40,000 | 74,000 | <40,000 | <40,000 | <17,000 | <17,000 | 29,000 | <8,300 | <8,300 | <8,300 | <40,000 | <8,300 | <8,300 | <40,000 | <40,000 | NA | NA | NA | <8,300 | <8,300 | <8,300 | <40,000 | <8,300 | <40,000 | <40,000 | <8,300 | <40,000 | NA | <8,300 | <8,300 |
| A5F170015-004 | FMSOSB4/5-7 | SB-4 | 6/15/95 | <1,900 | <1,900 | 330 J | <1,900 | <1,900 | <800 | <800 | 200 J | <400 | <400 | <400 | <1,900 | <400 | <400 | <1,900 | <1,900 | NA | NA | NA | <400 | <400 | <400 | <1,900 | <400 | <1,900 | <1,900 | <400 | <1,900 | NA | <400 | <400 |
| A5F170015-001 | FMSOSB5/1-3 | SB-5 | 6/15/95 | <2,000 | <2,000 | <420 | <2,000 | <2,000 | <840 | <840 | <420 | <420 | <420 | <420 | <2,000 | <420 | <420 | <2,000 | <2,000 | NA | NA | NA | <420 | <420 | <420 | <2,000 | <420 | <2,000 | <2,000 | <420 | <2,000 | NA | <420 | <420 |
| A5F170015-002 | FMSOSB5/5-7 | SB-5 | 6/15/95 | <1,900 | <1,900 | <400 | <1,900 | <1,900 | <800 | <800 | <400 | <400 | <400 | <400 | <1,900 | <400 | <400 | <1,900 | <1,900 | NA | NA | NA | <400 | <400 | <400 | <1,900 | <400 | <1,900 | <1,900 | <400 | <1,900 | NA | <400 | <400 |
| A5D200054-020 | FMSOSB6/5-7' | SB-6 | 4/19/95 | <2,000 | <2,000 | <420 | <2,000 | <2,000 | <840 | <840 | <420 | <420 | <420 | <420 | <2,000 | <420 | <420 | <2,000 | <2,000 R | NA | NA | NA | <420 | <420 | <420 | <2,000 | <420 | <2,000 | <2,000 | <420 | <2,000 | NA | <420 | <420 |
| A5D200054-022 | FMSOSB6/1-3' | SB-6 | 4/19/95 | <2,000 | <2,000 | <400 | <2,000 | <2,000 | <810 | <810 | <400 | <400 | <400 | <400 | <2,000 | <400 | <400 | <2,000 | <2,000 R | NA | NA | NA | <400 | <400 | <400 | <2,000 | <400 | <2,000 | <2,000 | <400 | <2,000 | NA | <400 | <400 |

NOTES:
NA - NOT ANALYZED.
B - (COMPOUND DETECTED IN METHOD BLANK ASSOCIATED WITH THIS SAMPLE)
MS/MSD - MATRIX SPIKE/MATRIX SPIKE DUPLICATE
+ - SAMPLE RESULTS DETERMINED BY THE METHOD OF STANDARD ADDITIONS AND THE CORRELATION COEFFICIENT WAS LESS THAN 0.995.
W - POST DIGESTION SPIKE FELL BETWEEN 40-85% WHILE THE SAMPLE RESULT WAS LESS THAN ONE-HALF THE REPORTING LIMIT.
S - SAMPLE RESULT DETERMINED BY THE METHOD OF STANDARD ADDITIONS.

HASB - HAND-AUGERED SOIL BORING
SB - SOIL BORING
- EQUIPMENT BLANK
- WATER SAMPLES, MEASURED IN ug/L.

J - ESTIMATED VALUE
UJ - ESTIMATED VALUE ( NOT DETECTED).
R - UNUSABLE (NOT DETECTED).
U - NOT DETECTED.

GERAGHTY & MILLER, INC.

Table 4-8. Factors Affecting Contaminant Migration and Transformation, Federated Metals, Hammond, Indiana.

| Contaminant | | Solubility (mg/L) | Speciation | Adsorption (log KOC) | Leachability | Capacity to Exchange on silicate minerals | Biological Degradation | Hydrolysis | Oxidation | Photolysis | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *ORGANICS* | | | | | | | | | | AIR | WATER |
| *VOCs* | Acetone | Miscible | N/A | Low (0) | High | Low | Very Fast | High | Very Easy | - | Resistant |
| | Methyl ethyl ketone | 350 | N/A | Low (0) | High | Low | Very Fast | High | Very Easy | SLow | Resistant |
| | Carbon disulfide | 2,300 | N/A | High (2) | High | Low | Fast | Moderate | Very Easy | - | - |
| | Toluene | 515 | N/A | High (2.1) | Moderate | Moderate | Fast | Moderate | Easy | Moderate | Moderate |
| | Xylenes (Total) | 150-200 | N/A | High (2.3) | Moderate | Moderate | Fast | Moderate | Easy | Fast | - |
| | PCE | 150 | N/A | High (2.6) | Low | Low | Slow | Very Low | Resistant | Very Slow | - |
| | TCE | 1,100 | N/A | High (2) | Moderate | Moderate | Slow | Very Low | Resistant | Slow | - |
| | 1,1-DCA | 5,500 | N/A | Moderate (1.5) | Moderate | Moderate | Moderate | Very Low | Slow | Very Slow | - |
| | 1,2-DCE (total) | 600-800 | N/A | Moderate (1.8) | Moderate | Moderate | Moderate | Very Low | Slow | Slow | - |
| *SVOCs* | Coal tar constituents (i.e. acenapthlene - napthalene) | <1 | N/A | Very Low | Very Low | High | Moderate to Slow | Low to Very Low | Moderate to very Slow | Resistant | Resistant |
| | Phthalates | <1 | N/A | Very Low | Very Low | High | Moderate | Low | Moderate | Very Slow | Very Slow |
| | Dibenzofuran | 10 | N/A | Low | Low | High | Moderate | Low | Moderate | - | Very Slow |
| | Diphenylamine | 300 | N/A | Low | Low | High | Moderate | - | Moderate | Moderate | Very Slow |
| | Pentachloroethane | 500-750 | N/A | Moderate | Moderate | Moderate | Slow | Very Low | - | - | - |
| | 4,6 Dinitro-2-methylphenol | 130 | N/A | Low | Low | High | Moderate | - | Moderate | Very Slow | Very Slow |
| *INORGANICS* | | | | | | | | | | | |
| | Silver | Very Low | +1 or +2 | Low | Low | Low | - | - | - | - | - |
| | Barium | Very Low | Not stable | High | Low | High | - | - | - | - | - |
| | Beryllium | Very Low | Hydroxides | High | Low | High | - | - | - | - | - |
| | Cadmium | Very Low | Not stable | High | Low | High | - | - | - | - | - |
| | Cobalt | Very Low | +2 or +3 | High | Low | High | - | - | - | - | - |
| | Chromium | Varies | Many possible | Varies | High | Low | - | - | - | - | - |
| | Copper | Low | +1 or +2 | Low | High | Low | - | - | - | - | - |
| | Nickel | Moderate | Not stable | Low | Moderate | Moderate | - | - | - | - | - |
| | Antimony | Low | Many | Low | Low | Moderate | - | - | - | - | - |
| | Vanadium | Moderate to High | Many | Low | High | Low | - | - | - | - | - |
| | Zinc | Low | Some Hydroxides | High | Low | High | - | - | - | - | - |
| | Arsenic | Varies | Many | High | Low to High | Very Low | - | - | - | - | - |
| | Lead | Very Low | Not stable | High | Low | High | - | - | - | - | - |
| | Mercury | Very Low | Many | Low | Moderate | Low | - | - | - | - | - |
| | Selenium | Low to Moderate | Many possible | Low to High | Low to High | Low | - | - | - | - | - |
| | Thallium | Low | +2 | Low | Low | Low | - | - | - | - | - |
| | Tin | Low | +2 and +4 | High | Moderate | High | - | - | - | - | - |
| | | | | | | | - | - | - | - | - |
| | Fluoride | High | Not stable | None | High | None | - | - | - | - | - |
| | Cyanide (total) | High | Many possible | Very Low | High | Very Low | - | - | - | - | - |

(o) - Log KOC (Octanol partition coefficient)
NA - Not applicable

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Table 4-9. Groundwater Analytical Results, Appendix IX Parameters / Volatile Organic Compounds, Federated Metals, Hammond, Indiana.

GC/MS VOLATILE SAMPLE DATA

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | cis-1,3-Dichloropropene | trans-1,3-Dichloropropene | 1,4-Dioxane | Ethylbenzene | Ethyl methacrylate | 2-Hexanone | Iodomethane | Isobutyl alcohol | Methacrylonitrile | Methylene chloride | Methyl methacrylate | 4-Methyl-2-pentanone (MIBK) | Propionitrile | Styrene | 1,1,1,2-Tetrachloroethane | 1,1,2,2-Tetrachloroethane | Tetrachloroethene | Toluene | 1,1,1-Trichloroethane | 1,1,2-Trichloroethane | Trichloroethene | Trichlorofluoromethane | 1,2,3-Trichloropropane | Vinyl acetate | Vinyl chloride | Xylenes, Total | 1,2-Dichloroethene (Total) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5G200131-002 | FMGWMW6S | MW-6S | 7/18/95 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <5.0 | <500 R | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 UJ | <5.0 | <50 UJ | <10 | <5.0 | <5.0 |
| A5G200131-001 | FMGWMW6D | MW-6D | 7/18/95 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <5.0 | <500 R | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 UJ | <5.0 | <50 UJ | <10 | <5.0 | <5.0 |
| A5H010101-002 | FMGWMW7S | MW-7S | 7/28/95 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <5.0 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A5H010101-003 | FMGWMW58 | MW-7S (Duplicate) | 7/28/95 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <5.0 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A5H010101-004 | FMGWMW7D | MW-7D | 7/28/95 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <5.0 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A5H030106-002 | FMGWMW8S (MS/MSD) | MW-8S | 8/1/95 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <5.0 | <500 R | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 J | <10 | <5.0 | <5.0 |
| A5G210121-003 | FMGWMW8D | MW-8D | 7/20/95 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <5.0 | <500 R | <20 | <5.0 | <5.0 | <50 | <20 R | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 J | <10 | <5.0 | <5.0 |
| A5H030125-002 | FMGWMW9S | MW-9S | 8/2/95 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <5.0 | <500 R | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A5H030125-003 | FMGWMW61 | MW-9S (Duplicate) | 8/2/95 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <5.0 | <500 R | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A5H030125-004 | FMGWMW9D (MS/MSD) | MW-9D | 8/2/95 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <5.0 | <500 R | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A5G220128-001 | FMGWMW10S | MW-10S | 7/21/95 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <5.0 | <500 R | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 UJ | <10 | <5.0 | <5.0 |
| A5G220128-002 | FMGWMW10D | MW-10D | 7/21/95 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <5.0 | <500 R | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 UJ | <10 | <5.0 | <5.0 |
| A5G250105-001 | FMGWMW11S | MW-11S | 7/24/95 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <5.0 | <500 R | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 UJ | <10 | <5.0 | <5.0 |
| A5G270116-002 | FMGWMW11D | MW-11D | 7/26/95 | <5.0 | <5.0 | <1,000 J | <5.0 | <5.0 | <50 | <5.0 | <500 J | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A5H010101-001 | FMGWMW12S | MW-12S | 7/27/95 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <5.0 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | 22 | <5.0 | <50 | <10 | <5.0 | 100 |
| A5G270116-005 | FMGWMW12D | MW-12D | 7/26/95 | <5.0 | <5.0 | <1,000 J | <5.0 | <5.0 | <50 | <5.0 | <500 J | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A5G210121-002 | FMGWMW13S | MW-13S | 7/19/95 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <5.0 | <500 R | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 J | <5.0 J | <50 | <10 | <5.0 | <5.0 |
| A5G210121-001 | FMGWMW13D | MW-13D | 7/19/95 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <5.0 | <500 R | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 J | <5.0 | <50 J | <10 | <5.0 | <5.0 |
| A5H010101-005 | FMGWMW59 | Equipment Blank | 7/28/95 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <5.0 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A5H030125-001 | FMGWMW60 | Equipment Blank | 8/2/95 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <5.0 | <500 R | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A5G200131-003 | TRIP BLANK | Trip Blank MW6S,6D | 7/18/95 | <5.0 | <5.0 | <1,000 | <5.0 | <5.0 | <50 | <5.0 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A5H010101-006 | TRIP BLANK | Trip Blank MW7S,7D,12S | 7/28/95 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 J | <5.0 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A5H030106-003 | TRIP BLANK | Trip Blank MW8S | 8/1/95 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <5.0 | <500 R | <20 J | <5.0 | <5.0 J | <50 | <20 R | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 J | <10 | <5.0 | <5.0 |
| A5G210121-005 | TRIP BLANK | Trip Blank MW8D | 7/19/95 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <5.0 | <500 R | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A5H030125-005 | TRIP BLANK | Trip Blank MW9S,9D | 8/2/95 | <5.0 | <5.0 | <1,000 | <5.0 | <5.0 | <50 | <5.0 | <500 R | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A5G220128-003 | TRIP BLANK | Trip Blank MW10S,10D | 7/21/95 | <5.0 | <5.0 | <1,000 | <5.0 | <5.0 | <50 | <5.0 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A5G250105-002 | TRIP BLANK | Trip Blank MW11S | 7/24/95 | <5.0 | <5.0 | <1,000 | <5.0 | <5.0 | <50 | <5.0 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A5G270116-008 | TRIP BLANK | Trip Blank MW11D,12D | 7/26/95 | <5.0 | <5.0 | <1,000 J | <5.0 | <5.0 | <50 | <5.0 | <500 J | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A5G210121-004 | TRIP BLANK | Trip Blank MW13S,13D | 7/19/95 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <5.0 | <500 R | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |

Notes:
Samples analyzed by Quanterra, Inc., North Canton, Ohio.
Samples for volatile organics by GC/MS (SW 846 8240A)
Analytical results reported in ug/L.
NA - Parameter not analyzed.
J - Estimated value
UJ - Not detected and estimated value
R - Rejected value
U - Not detected

Table 4-10. Groundwater Analytical Results, Appendix IX Parameters / Semi-Volatile Organic Compounds, Federated Metals, Hammond, Indiana.

GC/MS SEMIVOLATILE SAMPLING DATA

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | 2-Chlorophenol | 4-Chlorophenyl phenyl ether | Chrysene | Dibenz(a,h)anthracene | Dibenzofuran | Di-n-butyl phthalate | 1,2-Dichlorobenzene | 1,3-Dichlorobenzene | 1,4-Dichlorobenzene | 3,3'-Dichlorobenzidine | 2,4-Dichlorophenol | 2,6-Dichlorophenol | Diethyl phthalate | p-(Dimethylamino)azobenzene | 7,12-Dimethylbenz(a)-anthracene | 3,3'-Dimethylbenzidine | a,a-Dimethylphenethylamine | 2,4-Dimethylphenol | Dimethyl phthalate | 1,3-Dinitrobenzene | 4,6-Dinitro-2-methylphenol | 2,4-Dinitrophenol | 2,4-Dinitrotoluene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5G200131-002 | FMGWMW6S | MW-6S | 7/18/95 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <20 | <50 J | <10 | <10 | <10 | <50 | <50 | <10 |
| A5G200131-001 | FMGWMW6D | MW-6D | 7/18/95 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <20 | <50 J | <10 | <10 | <10 | <50 | <50 | <10 |
| A5H010101-002 | FMGWMW7S | MW-7S | 7/28/95 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <20 | <50 UJ | <10 | <10 | <10 | <50 | <50 | <10 |
| A5H010101-003 | FMGWMW58 | MW-7S (Duplicate) | 7/28/95 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <20 | <50 UJ | <10 | <10 | <10 | <50 | <50 | <10 |
| A5H010101-004 | FMGWMW7D | MW-7D | 7/28/95 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <20 | <50 UJ | <10 | <10 | <10 | <50 | <50 | <10 |
| A5H030106-002 | FMGWMW8S (MS/MSD) | MW-8S | 8/1/95 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <20 | <50 J | <10 | <10 | <10 | <50 | <50 | <10 |
| A5G210121-003 | FMGWMW8D | MW-8D | 7/20/95 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <50 | <10 | <10 | <10 | <20 | <20 | <20 | <10 | <50 J | <10 | <10 | <10 | <50 | <50 | <10 |
| A5H030125-002 | FMGWMW9S | MW-9S | 8/2/95 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <20 | <50 | <10 | <10 | <10 | <50 | <50 | <10 |
| A5H030125-003 | FMGWMW61 | MW-9S (Duplicate) | 8/2/95 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <20 | <50 | <10 | <10 | <10 | <50 | <50 | <10 |
| A5H030125-004 | FMGWMW9D (MS/MSD) | MW-9D | 8/2/95 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <20 | <50 UJ | <10 | <10 | <10 | <50 | <50 | <10 |
| A5G220128-001 | FMGWMW10S | MW-10S | 7/21/95 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <20 | <50 UJ | <10 | <10 | <10 | <50 | <50 | <10 |
| A5G220128-002 | FMGWMW10D | MW-10D | 7/21/95 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <20 | <50 UJ | <10 | <10 | <10 | <50 | <50 | <10 |
| A5G250105-001 | FMGWMW11S | MW-11S | 7/24/95 | <10 | <10 | 3.1 UJ | <10 | <10 | <10 | <10 | <10 | <10 | <50 | <10 | <10 | <10 | <20 | <20 | <10 | <50 UJ | <10 | <10 | <10 | <50 | <50 | <10 |
| A5G270116-002 | FMGWMW11D | MW-11D | 7/26/95 | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <20 J | <20 J | <50 J | <10 J | <10 J | <10 J | <50 J | <50 J | <10 J |
| A5H010101-001 | FMGWMW12S | MW-12S | 7/27/95 | <10 UJ, R | <10 UJ, R | <10 UJ, R | <10 UJ, R | <10 UJ, R | <10 UJ, R | <10 UJ, R | <10 UJ, R | <10 UJ, R | <10 UJ, R | <10 UJ, R | <10 UJ, R | <10 UJ, R | <10 UJ, R | <20 UJ, R | <20 UJ, R | <50 UJ | <10 UJ, R | <10 UJ, R | <10 UJ, R | <50 UJ, R | <50 UJ, R | <10 UJ, R |
| A5G270116-005 | FMGWMW12D | MW-12D | 7/26/95 | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <20 J | <20 J | <50 J | <10 J | <10 J | <10 J | <50 J | <50 J | <10 J |
| A5G210121-002 | FMGWMW13S | MW-13S | 7/19/95 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <50 | <10 | <10 | <10 | <20 | <20 | <10 | <50 J | <10 | <10 | <10 | <50 | <50 | <10 |
| A5G210121-001 | FMGWMW13D | MW-13D | 7/19/95 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <20 | <50 J | <10 | <10 | <10 | <50 | <50 | <10 |
| A5H030125-001 | FMGWMW60 | Equipment Blank | 8/2/95 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <20 | <50 | <10 | <10 | <10 | <50 | <50 | <10 |
| A5H010101-005 | FMGWMW59 | Equipment Blank | 7/28/95 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <20 | <50 UJ | <10 | <10 | <10 | <50 | <50 | <10 |

Notes:
Samples analyzed by Quanterra, Inc., North Canton, Ohio.
Samples for semi-volatile organics by GC/MS (SW 846 8270A)
Analytical results reported in ug/L.
NA - Parameter not analyzed.
J - Estimated value
UJ - Not detected and estimated value
R - Rejected value
U - Not detected

Table 4-10. Groundwater Analytical Results, Appendix IX Parameters / Semi-Volatile Organic Compounds, Federated Metals, Hammond, Indiana.

GC/MS SEMIVOLATILE SAMPLING DATA

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Naphthalene | 1,4-Naphthoquinone | 1-Naphthylamine | 2-Naphthylamine | 2-Nitroaniline | 3-Nitroaniline | 4-Nitroaniline | Nitrobenzene | 2-Nitrophenol | 4-Nitrophenol | 4-Nitroquinoline-1-oxide | N-Nitrosodi-n-butylamine | N-Nitrosodiethylamine | N-Nitrosodimethylamine | N-Nitrosodiphenylamine | N-Nitrosodi-n-propylamine | N-Nitrosomethylethylamine | N-Nitrosomorpholine | N-Nitrosopiperidine | N-Nitrosopyrrolidine | 5-Nitro-o-toluidine | Pentachlorobenzene | Pentachloroethane |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5G200131-002 | FMGWMW6S | MW-6S | 7/18/95 | <10 | <200 UJ | <10 | <10 | <50 | <50 | <50 UJ | <10 | <10 | <50 UJ | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <10 | <50 |
| A5G200131-001 | FMGWMW6D | MW-6D | 7/18/95 | <10 | <200 UJ | <10 | <10 | <50 | <50 | <50 UJ | <10 | <10 | <50 UJ | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <10 | <50 |
| A5H010101-002 | FMGWMW7S | MW-7S | 7/28/95 | <10 | <200 UJ | <10 | <10 | <50 | <50 | <50 | <10 | <10 | <50 UJ | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <10 | <50 |
| A5H010101-003 | FMGWMW58 | MW-7S (Duplicate) | 7/28/95 | <10 | <200 UJ | <10 | <10 | <50 | <50 | <50 | <10 | <10 | <50 UJ | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <10 | <50 |
| A5H010101-004 | FMGWMW7D | MW-7D | 7/28/95 | <10 | <200 UJ | <10 | <10 | <50 | <50 | <50 | <10 | <10 | <50 UJ | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <10 | <50 |
| A5H030106-002 | FMGWMW8S (MS/MSD) | MW-8S | 8/1/95 | <10 | <200 | <10 | <10 | <50 | <50 | <50 | <10 | <10 | <50 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <10 | <50 |
| A5G210121-003 | FMGWMW8D | MW-8D | 7/20/95 | <10 | <50 | <10 | <10 | <50 | <50 | <50 J | <10 | <10 | <50 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <10 | <10 |
| A5H030125-002 | FMGWMW9S | MW-9S | 8/2/95 | <10 | <200 | <10 | <10 | <50 | <50 | <50 | <10 | <10 | <50 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <10 | <50 |
| A5H030125-003 | FMGWMW61 | MW-9S (Duplicate) | 8/2/95 | <10 | <200 | <10 | <10 | <50 | <50 | <50 | <10 | <10 | <50 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <10 | <50 |
| A5H030125-004 | FMGWMW9D (MS/MSD) | MW-9D | 8/2/95 | <10 | <200 | <10 | <10 | <50 | <50 | <50 | <10 | <10 | <50 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <10 | <50 |
| A5G220128-001 | FMGWMW10S | MW-10S | 7/21/95 | <10 | <200 | <10 | <10 | <50 | <50 | <50 UJ | <10 | <10 | <50 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <10 | <50 |
| A5G220128-002 | FMGWMW10D | MW-10D | 7/21/95 | <10 | <200 | <10 | <10 | <50 | <50 | <50 UJ | <10 | <10 | <50 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <10 | <50 |
| A5G250105-001 | FMGWMW11S | MW-11S | 7/24/95 | 2.3 J | <50 | <10 | <10 | <50 | <50 | <50 UJ | <10 | <10 | <50 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <10 | <10 |
| A5G270116-002 | FMGWMW11D | MW-11D | 7/26/95 | <10 J | <200 J | <10 J | <10 J | <50 J | <50 J | <50 J | <10 J | <10 J | <50 J | <100 J | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <20 J | <10 J | <50 J |
| A5H010101-001 | FMGWMW12S | MW-12S | 7/27/95 | <10 UJ, R | <200 R | <10 UJ, R | <10 UJ, R | <50 UJ, R | <50 UJ, R | <50 UJ, R | <10 UJ, R | <10 UJ, R | <50 UJ, R | <100 UJ, F | <10 UJ, R | <10 UJ, R | <10 UJ, R | <10 UJ, R | <10 UJ, R | <10 UJ, R | <10 UJ, R | <10 UJ, R | <10 UJ, R | <20 UJ, R | <10 UJ, R | <50 UJ, R |
| A5G270116-005 | FMGWMW12D | MW-12D | 7/26/95 | <10 J | <200 J | <10 J | <10 J | <50 J | <50 J | <50 J | <10 J | <10 J | <50 J | <100 J | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <10 J | <20 J | <10 J | <50 J |
| A5G210121-002 | FMGWMW13S | MW-13S | 7/19/95 | <10 | <50 | <10 | <10 | <50 | <50 | <50 J | <10 | <10 | <50 J | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <10 | <10 |
| A5G210121-001 | FMGWMW13D | MW-13D | 7/19/95 | <10 | <200 | <10 | <10 | <50 | <50 | <50 J | <10 | <10 | <50 J | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <10 | <50 |
| A5H030125-001 | FMGWMW60 | Equipment Blank | 8/2/95 | <10 | <200 | <10 | <10 | <50 | <50 | <50 | <10 | <10 | <50 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <10 | <50 |
| A5H010101-005 | FMGWMW59 | Equipment Blank | 7/28/95 | <10 | <200 UJ | <10 | <10 | <50 | <50 | <50 | <10 | <10 | <50 UJ | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <20 | <10 | <50 |

Notes:
Samples analyzed by Quanterra, Inc., North Canton, Ohio.
Samples for semi-volatile organics by GC/MS (SW 846 8270A)
Analytical results reported in ug/L.
NA - Parameter not analyzed.
J - Estimated value
UJ - Not detected and estimated value
R - Rejected value
U - Not detected

Table 4-11. Groundwater Analytical Results, Appendix IX Parameters - Total Metals, Federated Metals, Hammond, Indiana.

| | | | | TOTAL METALS SAMPLE DATA | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Silver | Barium | Beryllium | Cadmium | Cobalt | Chromium | Copper | Nickel | Antimony | Tin | Vanadium | Zinc | Arsenic | Lead | Mercury | Selenium | Thallium |
| A5G200131-002 | FMGWMW6S | MW-6S | 7/18/95 | <10.0 | 242 | <5.0 | <5.0 | <50.0 | 19.5 | <25.0 | <40.0 | <60.0 | <100 | <50.0 | 88.6 | 14.3 | 19.4 | <0.20 | <5.0 W UJ | <10.0 W UJ |
| A5G200131-001 | FMGWMW6D | MW-6D | 7/18/95 | <10.0 | 374 | <5.0 | <5.0 | <50.0 | 50.3 | 61.4 | 58.9 | <60.0 | <100 | 66.4 | 200 | 21 | 50.2 | <0.20 | <5.0 W UJ | <10.0 W UJ |
| A5H010101-002 | FMGWMW7S | MW-7S | 7/28/95 | <10.0 | 274 | <5.0 | <10.0 | <50.0 | 25.4 | 8700 | 106 | <300 | 1,260 | <50.0 | 9230 J | 113 | 9460 J | 0.0038 | <5.0 W | <10.0 |
| A5H010101-003 | FMGWMW58 | MW-7S (Duplicate) | 7/28/95 | <10.0 | 237 | <5.0 | <10.0 | <50.0 | <20.0 | 8390 | 91.1 | <300 | <1,000 | <50.0 | 9,090 | 86.6 | 9320 J | 0.0038 | <5.0 W | <10.0 W |
| A5H010101-004 | FMGWMW7D | MW-7D | 7/28/95 | <10.0 | 259 | <5.0 | <10.0 | <50.0 | 40.2 | 413 J | 46.2 | <300 | <1,000 | <50.0 | 475 | 60.5 | 225 J | 4.3 | <5.0 W | <10.0 W |
| A5H030106-002 | FMGWMW8S (MS/MSD) | MW-8S | 8/1/95 | <10.0 | 532 | <5.0 | 42 | <50.0 | 90 | 9,950 | 1,240 | 714 | 2,310 | 73 | 16,100 | 114 | 10,400 | <0.20 | <5.0 W | <10.0 W |
| A5G210121-003 | FMGWMW8D | MW-8D | 7/20/95 | <10.0 | 219 | <5.0 | <10.0 | <50.0 | 65.1 | 827 | 147 | <300 | <1,000 | 83.7 | 1,320 | 32.4 | 627 | <0.20 | <10.0 W* J | <10.0 W UJ |
| A5H030125-002 | FMGWMW9S | MW-9S | 8/2/95 | <10.0 | 815 | <5.0 | 12.5 J | <50.0 | 40.2 | 3,800 | 90.7 | <300 | <1,000 | 60.6 | 3780 J | 128 | 3,940 | 0.44 | <5.0 W* UJ | <10.0 |
| A5H030125-003 | FMGWMW61 | MW-9S (Duplicate) | 8/2/95 | <10.0 | 652 | <5.0 | 10.5 | <50.0 | 37 J | 3,220 | 70.4 | <300 | <1,000 | <50.0 | 3050 J | 142 | 4,310 | 0.33 | <5.0 W UJ | <10.0 |
| A5H030125-004 | FMGWMW9D (MS/MSD) | MW-9D | 8/2/95 | <10.0 | 264 | <5.0 | <10.0 | <50.0 | 64.4 | 118 | 73.8 | <300 | <1,000 | 85.5 | 484 | 32 | 76.9 | <0.20 | <10.0 W* U | <10.0 W UJ |
| A5G220128-001 | FMGWMW10S | MW-10S | 7/21/95 | <10.0 | 509 | <5.0 | 10.5 J | <50.0 | 85.7 | 4,910 | 210 | <300 | <1,000 | 113 | 6,740 | 131 | 2,230 | 0.9 | <5.0 W UJ | <10.0 W UJ |
| A5G220128-002 | FMGWMW10D | MW-10D | 7/21/95 | <10.0 | 269 | <5.0 | <10.0 | <50.0 | 60.7 | 97.3 | 87.4 | <300 | <1,000 | 79.5 | 354 | 344 | 39.6 | <0.20 | <5.0 W UJ | <10.0 W UJ |
| A5G250105-001 | FMGWMW11S | MW-11S | 7/24/95 | <10.0 | <200 | <5.0 | 53.1 | <50.0 | 25.6 | 543 | 215 | <60.0 | 537 | <50.0 | 4220 J | 25.5 J | 1,360 | 0.59 | <5.0 W UJ | <10.0 W |
| A5G270116-002 | FMGWMW11D | MW-11D | 7/26/95 | <10.0 | 422 | <5.0 | <10.0 | 59.8 | 111 | 253 | 183 | <300 | <1,000 | 149 | 1,340 | 437 | 291 | 3.2 | <20.0 W* | <20.0 W* |
| A5H010101-001 | FMGWMW12S | MW-12S | 7/27/95 | <10.0 | 174 | <5.0 | <10.0 | <50.0 | 23.6 | 198 J | <40.0 | <300 | <1,000 | <50.0 | 333 | 31.6 | 106 | <0.20 | <10.0 | <10.0 |
| A5G270116-005 | FMGWMW12D | MW-12D | 7/26/95 | <10.0 | 190 | <5.0 | <10.0 | <50.0 | 40.4 | 72.3 | 50.3 | <300 | <1,000 | <50.0 | 647 | 23.2 | 36.3 J | <0.20 | <20.0 W* | <10.0 W |
| A5G210121-002 | FMGWMW13S | MW-13S | 7/19/95 | <10.0 | 150 | <5.0 | <10.0 | <50.0 | <20.0 | 93.5 | <40.0 | <300 | <1,000 | <50.0 | 212 | 28 | 75.2 | <0.20 | <5.0 W J | <10.0 J |
| A5G210121-001 | FMGWMW13D | MW-13D | 7/19/95 | <10.0 | 332 | <5.0 | <10.0 | <50.0 | 56.4 | 75.4 | 71.7 | <300 | <1,000 | 63.1 | 279 | 22.2 | 38.8 | <0.20 | <20.0 W* J | <10.0 W J |
| A5H030125-001 | FMGWMW60 | Equipment Blank | 8/2/95 | <10.0 | <10.0 | <5.0 | <10.0 | <50.0 | <20.0 | <10.0 | <40.0 | <300 | <1,000 | <50.0 | <50.0 UJ | <5.0 | <3.0 | <0.20 | <5.0 | <10.0 |
| A5H010101-005 | FMGWMW59 | Equipment Blank | 7/28/95 | <10.0 | <10.0 | <5.0 | <10.0 | <50.0 | <20.0 | <10.0 | <40.0 | <300 | <1,000 | <50.0 | <50.0 | <5.0 | <3.0 | <0.20 | <5.0 | <10.0 |

Notes:

Samples analyzed by Quanterra, Inc., North Canton, Ohio.
Samples for total and dissolved Inductively Coupled Plasma (ICP) metals (SW846 6010A)
Samples for total and dissolved Arsenic (AA, Furnace technique) (SW846 7060)
Samples for total and dissolved Lead (AA, Furnace technique) (SW846 7421)
Samples for total and dissolved Mercury (Manual cold-vapor) (SW846 7470)
Samples for total and dissolved Selenium (AA, Furnace technique) (SW846 7740)
Samples for total and dissolved Thallium (AA, Furnace technique) (SW846 7841)
Analytical results reported in ug/L.
NA - Parameter not analyzed.
W - Post digestion spike recovery fell between 40-85% while sample result was less than one-half the reporting limit.
* - Elevated detection limit due to matrix interference.
UJ - Not detected and estimated value
R - Rejected value
U - Not detected

Table 4-13. Groundwater Analytical Results, Appendix IX Parameters - Organophosphorus and Wet Chemistry Sample Data, Federated Metals, Hammond, Indiana.

| | | | | ORGANOPHOSPHORUS SAMPLE DATA | | | | | | | | WET CHEMISTRY DATA | | SAMPLE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Dimethoate | Disulfoton | Famphur | Methyl parathion | Parathion | Phorate | Tetraethyldithiopyro-phosphate | 0,0,0-Triethylphosphoro-thioate | Fluoride (Potentiometric, Ion Selective Electrode) | Sulfide | Total cyanide |
| A5G200131-002 | FMGWMW6S | MW-6S | 7/18/95 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | 1,200 | <500 | <5.0 |
| A5G200131-001 | FMGWMW6D | MW-6D | 7/18/95 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | 7,100 | <500 | <5.0 |
| A5H010101-002 | FMGWMW7S | MW-7S | 7/28/95 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | 7,600 | <1,000 | <5.0 |
| A5H010101-003 | FMGWMW58 | MW-7S (Duplicate) | 7/28/95 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | 8,300 | <1,000 | <5.0 |
| A5H010101-004 | FMGWMW7D | MW-7D | 7/28/95 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | 3,300 | <1,000 | <5.0 |
| A5H030106-002 | FMGWMW8S (MS/MSD) | MW-8S | 8/1/95 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | 5,200 | <1,000 | <5.0 |
| A5G210121-003 | FMGWMW8D | MW-8D | 7/20/95 | <1.6 | <1.6 | <1.6 | <1.6 | <1.6 | <1.6 | <1.6 | <1.6 | 27,000 | <500 | <5.0 |
| A5H030125-002 | FMGWMW9S | MW-9S | 8/2/95 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | 17,000 | <1,000 | <5.0 |
| A5H030125-003 | FMGWMW61 | MW-9S (Duplicate) | 8/2/95 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | 18,000 | <1,000 | <5.0 |
| A5H030125-004 | FMGWMW9D (MS/MSD) | MW-9D | 8/2/95 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | 24,000 | 1,100 | <5.0 |
| A5G220128-001 | FMGWMW10S | MW-10S | 7/21/95 | NA | NA | NA | NA | NA | NA | NA | NA | 8,800 | <500 | <5.0 |
| A5G220128-002 | FMGWMW10D | MW-10D | 7/21/95 | NA | NA | NA | NA | NA | NA | NA | NA | 5,100 | <500 | <5.0 |
| A5G250105-001 | FMGWMW11S | MW-11S | 7/24/95 | NA | NA | NA | NA | NA | NA | NA | NA | 8,800 | 740 | <5.0 |
| A5G270116-002 | FMGWMW11D | MW-11D | 7/26/95 | NA | NA | NA | NA | NA | NA | NA | NA | 12,000 | 900 | <5.0 |
| A5H010101-001 | FMGWMW12S | MW-12S | 7/27/95 | NA | NA | NA | NA | NA | NA | NA | NA | 3,700 | <1,000 | <5.0 |
| A5G270116-005 | FMGWMW12D | MW-12D | 7/26/95 | NA | NA | NA | NA | NA | NA | NA | NA | 14,000 | 740 | <5.0 |
| A5G210121-002 | FMGWMW13S | MW-13S | 7/19/95 | NA | NA | NA | NA | NA | NA | NA | NA | 6,400 | <500 | <5.0 |
| A5G210121-001 | FMGWMW13D | MW-13D | 7/19/95 | NA | NA | NA | NA | NA | NA | NA | NA | 4,700 | <500 | <5.0 |
| A5H030125-001 | FMGWMW60 | Equipment Blank | 8/2/95 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <1,200 | <1,000 | <5.0 |
| A5H010101-005 | FMGWMW59 | Equipment Blank | 7/28/95 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <1,200 | <1,000 | <5.0 |

Notes:

Samples analyzed by Quanterra, Inc., North Canton, Ohio.
Samples for Organophosphorus compounds by GC (SW 846 8141)
Samples for Fluoride (potentiometric, ion selective electrode) by MCAWW 340.2
Samples for Sulfide by MCAWW 376.1
Samples for Total Cyanide by SW846 9012
Analytical results reported in ug/L.
NA - Parameter not analyzed.

Table 4-14. Groundwater Analytical Results, Appendix IX Parameters - Pesticides/PCBs/Chlorinated herbicides, Federated Metals, Hammond, Indiana.

| | | | | PESTICIDE/PCB SAMPLE DATA | | | | | | | HERBICIDES | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Endrin aldehyde | Heptachlor | Heptachlor epoxide | Isodrin | Kepone | Methoxychlor | Toxaphene | 2,4-D | 2,4,5-TP (Silvex) | 2,4,5-T | Dinoseb |
| A5G200131-002 | FMGWMW6S | MW-6S | 7/18/95 | <0.10 | <0.050 | <0.050 | <0.050 | <1.0 | <0.50 | <1.0 | <0.50 | <0.20 | <0.10 | <1.0 |
| A5G200131-001 | FMGWMW6D | MW-6D | 7/18/95 | <0.10 | <0.050 | <0.050 | <0.050 | <1.0 | <0.50 | <1.0 | <0.50 | <0.20 | <0.10 | <1.0 |
| A5H010101-002 | FMGWMW7S | MW-7S | 7/28/95 | <0.10 | <0.050 | <0.050 | <0.050 | <1.0 | <0.50 | <1.0 | <0.50 | <0.20 | <0.10 | <1.0 |
| A5H010101-003 | FMGWMW58 | MW-7S (Duplicate) | 7/28/95 | <0.10 | <0.050 | <0.050 | <0.050 | <1.0 | <0.50 | <1.0 | <0.50 | <0.20 | <0.10 | <1.0 |
| A5H010101-004 | FMGWMW7D | MW-7D | 7/28/95 | <0.10 | <0.050 | <0.050 | <0.050 | <1.0 | <0.50 | <1.0 | <0.50 | <0.20 | <0.10 | <1.0 |
| A5H030106-002 | FMGWMW8S (MS/MSD) | MW-8S | 78/1/95 | <0.10 | <0.050 | <0.050 | <0.050 | <1.0 | <0.50 | <1.0 | <0.50 | <0.20 | <0.10 | <1.0 |
| A5G210121-003 | FMGWMW8D | MW-8D | 7/20/95 | <0.10 | <0.050 | <0.050 | <0.050 | <1.0 | <0.50 | <1.0 | <0.50 | <0.20 | <0.10 | <1.0 |
| A5H030125-002 | FMGWMW9S | MW-9S | 8/2/95 | <0.10 | <0.050 | <0.050 | <0.050 | <1.0 | <0.50 | <1.0 | <0.50 | <0.20 | <0.10 | <1.0 |
| A5H030125-003 | FMGWMW61 | MW-9S (Duplicate) | 8/2/95 | <0.10 | <0.050 | <0.050 | <0.050 | <1.0 | <0.50 | <1.0 | <0.50 | <0.20 | <0.10 | <1.0 |
| A5H030125-004 | FMGWMW9D (MS/MSD) | MW-9D | 8/2/95 | <0.10 | <0.050 | <0.050 | <0.050 | <1.0 | <0.50 | <1.0 | <0.50 | <0.20 | <0.10 | <1.0 |
| A5H010101-005 | FMGWMW59 | Equipment Blank | 7/28/95 | <0.10 | <0.050 | <0.050 | <0.050 | <1.0 | <0.50 | <1.0 | <0.50 | <0.20 | <0.10 | <1.0 |
| A5H030125-001 | FMGWMW60 | Equipment Blank | 8/2/95 | <0.10 | <0.050 | <0.050 | <0.050 | <1.0 | <0.50 | <1.0 | <0.50 | <0.20 | <0.10 | <1.0 |

Notes:
Samples analyzed by Quanterra, Inc., North Canton, Ohio.
Samples for Organochlorine Pesticides and PCBs by SW846 8080.
Samples for Chlorinated Herbicides by SW846 8150A
Analytical results reported in ug/L.

Table 4-16. Groundwater Analytical Results, Volatile Organic Compounds (VOCs), RFI Addendum, Federated Metals, Hammond, Indiana.

GC/MS VOLATILE SAMPLE DATA

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Acetone | Acetonitrile | Acrolein | Acrylonitrile | Allyl Chloride | Benzene | Bromodichloromethane | Bromoform | Bromomethane | 2-Butanone (MEK) | Carbon disulfide | Carbon Tetrachloride | Chlorobenzene | Chloroethane | Chloroform | Chloromethane | Chloroprene | Dibromochloromethane | 1,2-Dibromoethane | Dibromomethane | trans-1,4-Dichloro-2-butene | Dichlorodifluoromethane | 1,1-Dichloroethane | 1,2-Dichloroethane | 1,1-Dichloroethene | 1,2-Dichloroethene (Total) | 1,2-Dichloropropane |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A6E310136-008 | FMGWMW12S | MW-12S | 5/29/96 | <50 | <50 | <100 R | <50 | <5.0 | <5.0 | <5.0 | <10 | <10 UJ | <50 | <5.0 | <10 | <5.0 | <10 | <5.0 | <10 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <20 | <5.0 | <5.0 | <5.0 | 53 | <5.0 |
| A6E310136-013 | FMGWMW15S | MW-15S | 5/30/96 | 60 | <50 | <100 R | <50 | <5.0 | <5.0 | <5.0 | <10 | <10 UJ | <50 | <5.0 | <10 | <5.0 | <10 | <5.0 | <10 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| A6E310136-014 | TRIP BLANK | Trip Blank MW12S,15S | 5/30/96 | <50 | <50 | <100 R | <50 | <5.0 | <5.0 | <5.0 | <10 | <10 UJ | <50 | <5.0 | <10 | <5.0 | <10 | <5.0 | <10 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |

GC/MS VOLATILE SAMPLE DATA (Continued)

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | cis-1,3-Dichloropropene | trans-1,3-Dichloropropene | 1,4-Dioxane | Ethylbenzene | Ethyl methacrylate | 2-Hexanone | Iodomethane | Isobutyl alcohol | Methacrylonitrile | Methylene chloride | Methyl methacrylate | 4-Methyl-2-pentanone (MIBK) | 1,2-Dibromo-3-chloro-propane | Propionitrile | Styrene | 1,1,1,2-Tetrachloroethane | 1,1,2,2-Tetrachloroethane | Tetrachloroethene | Toluene | 1,1,1-Trichloroethane | 1,1,2-Trichloroethane | Trichloroethene | Trichlorofluoromethane | 1,2,3-Trichloropropane | Vinyl acetate | Vinyl chloride | Xylenes, Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A6E310136-008 | FMGWMW12S | MW-12S | 5/29/96 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <5.0 UJ | <500 | <20 | <5.0 | <5.0 | <50 | <10 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | 4.5J | <5.0 UJ | <5.0 | <50 | <10 | <5.0 |
| A6E310136-013 | FMGWMW15S | MW-15S | 5/30/96 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <5.0 UJ | <500 | <20 | <5.0 | <5.0 | <50 | <10 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 UJ | <5.0 | <50 | <10 | <5.0 |
| A6E310136-014 | TRIP BLANK | Trip Blank MW12S,15S | 5/30/96 | <5.0 | <5.0 | <1,000 R | <5.0 | <5.0 | <50 | <5.0 UJ | <500 | <20 | <5.0 | <5.0 | <50 | <10 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 UJ | <5.0 | <50 | <10 | <5.0 |

Notes:

Samples analyzed by Quanterra, Inc., North Canton, Ohio.
Samples for volatile organics by GC/MS (SW 846 8240B)
Analytical results reported in ug/L.
J - Estimated value (detected) but below quantitation limit.
UJ - Estimated value below the quantitation limit, based on data validation.
R - rejected data, based on data validation

Table 4-18. Comparison of Groundwater Analytical Results for Low-Flow Sampling vs. Conventional Sampling Techniques, Federated Metals, Hammond, Indiana.

| | | | PARAMETERS (where applicable, MCLs are listed) | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Date | Sampling Technique | Arsenic (50 ug/L) | Lead (15 ug/L*) | Selenium (50 ug/L) | Thallium (2 ug/L) | Silver (100 ug/L) | Barium (2,000 ug/L) | Beryllium (4 ug/L) | Cadmium (5 ug/L) | Cobalt | Chromium (100 ug/L) | Copper (1,000 ug/L) | Nickel (100 ug/L) | Antimony (6 ug/L) | Tin | Vanadium | Zinc (5,000 ug/L) | Mercury (2 ug/L) | Fluoride (4,000 ug/L) |
| MW-10S | 07/21/95 | Total Metals | **131** | **2,230** | <5.0 | <10.0 | <10.0 | 509 | <5.0 | **10.5** | <50.0 | 85.7 | **4,910** | **210** | <300 | <1,000 | 113 | **6,740** | 0.9 | **8,800** |
| | 07/26/95 | Dissolved Metals (0.01) | 23.5 | <3.0 | <5.0 | <10.0 | <10.0 | 132 | <5.0 | <10.0 | <50.0 | <20.0 | <10.0 | <40.0 | <300 | <1,000 | <50.0 | 178 | <0.20 | NA |
| | 05/30/96 | Low-Flow | <5.0 | <3.0 | <5.0 | <10.0 | <10.0 | 89.1 | <5.0 | <10.0 | <50.0 | <20.0 | 22.0 | <40.0 | <300 | <1,000 | <50.0 | 324 | <0.20 | 3,800 |
| | 06/12/96 | Dissolved Metals (0.045) | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| MW-10D | 07/21/95 | Total Metals | **344** | **39.6** | <5.0 | <10.0 | <10.0 | 269 | <5.0 | <10.0 | <50.0 | 60.7 | 97.3 | 87.4 | <300 | <1,000 | 79.5 | 354 | <0.20 | **5,100** |
| | 07/26/95 | Dissolved Metals (0.01) | **359** | <3.0 | <5.0 | <10.0 | <10.0 | 59.3 | <5.0 | <10.0 | <50.0 | <20.0 | 15.3 | <40.0 | <300 | <1,000 | <50.0 | 104 | <0.20 | NA |
| | 05/30/96 | Low-Flow | **56.5** | <3.0 | <5.0 | <10.0 | <10.0 | 49.7 | <5.0 | <10.0 | <50.0 | <20.0 | <10.0 | <40.0 | <300 | <1,000 | <50.0 | 382 | <0.20 | **8,700** |
| | 06/12/96 | Dissolved Metals (0.045) | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| MW-11S | 07/21/95 | Total Metals | 25.5 | **1,360** | <5.0 | <10.0 | <10.0 | <200 | <5.0 | **53.1** | <50.0 | 25.6 | 543 | **215** | <60.0 | 537 | <50.0 | 4,220 | 0.59 | **8,800** |
| | 07/26/95 | Dissolved Metals (0.01) | <5.0 | 12.7 | <5.0 | <10.0 | <10.0 | 74.8 | <5.0 | **11.3** | <50.0 | <20.0 | 12.4 | 59.8 | <300 | <1,000 | <50.0 | 2,220 | <0.20 | NA |
| | 05/30/96 | Low-Flow | <5.0 | **68.5** | <5.0 | <10.0 | <10.0 | 53.2 | <5.0 | **464** | <50.0 | <20.0 | 60.0 | <40.0 | <300 | <1,000 | <50.0 | **14,800** | <0.20 | **5,500** |
| | 06/12/96 | Dissolved Metals (0.045) | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| MW-11D | 07/26/95 | Total Metals | **437** | **291** | <20.0 | <20.0 | <10.0 | 422 | <5.0 | <10.0 | 59.8 | **111** | 253 | **183** | <300 | <1,000 | 149 | 1,340 | **3.2** | **12,000** |
| | 07/26/95 | Dissolved Metals (0.01) | **370** | <3.0 | <5.0 | <10.0 | <10.0 | 51.5 | <5.0 | <10.0 | <50.0 | <20.0 | <10.0 | 40.9 | <300 | <1,000 | <50.0 | 170 | **2.6** | NA |
| | 05/30/96 | Low-Flow | **938** | <3.0 | <5.0 | <10.0 | <10.0 | 23.5 | <5.0 | <10.0 | <50.0 | <20.0 | <10.0 | <40.0 | <300 | <1,000 | <50.0 | <50.0 | **2.4** | **6,100** |
| | 06/12/96 | Dissolved Metals (0.045) | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| MW-15S | 05/29/96 | Low-Flow | 9.5 | 4.1 | <5.0 | <10.0 | <10.0 | 133 | <5.0 | <10.0 | <50.0 | <20.0 | 106 | <40.0 | <300 | <1,000 | <50.0 | 587 | <0.20 | 1,400 |
| | 06/12/96 | Dissolved Metals (0.045) | 16.5 | <3.0 | NS | NS | NS | NS | NS | NS | NS | NS | <10.0 | NS | NS | NS | NS | 184 | NS | NS |
| MW-15S (Duplicate) | 06/12/96 | Dissolved Metals (0.045) | 13.1 | <3.0 | NS | NS | NS | NS | NS | NS | NS | NS | <10.0 | NS | NS | NS | NS | 155 | NS | NS |
| MW-16S | 05/29/96 | Low-Flow | 9.1 | <3.0 | <5.0 | <10.0 | <10.0 | 102 | <5.0 | <10.0 | <50.0 | <20.0 | <10.0 | <40.0 | <300 | <1,000 | <50.0 | 180 | <0.20 | **5,200** |
| | 06/12/96 | Dissolved Metals (0.045) | 8.1 | <3.0 | NS | NS | NS | NS | NS | NS | NS | NS | <10.0 | NS | NS | NS | NS | <50.0 | NS | NS |
| MW-16D | 05/29/96 | Low-Flow | 49.9 | <3.0 | <5.0 | <10.0 | <10.0 | 56.0 | <5.0 | <10.0 | <50.0 | <20.0 | <10.0 | <40.0 | <300 | <1,000 | <50.0 | 580 | 0.71 | 4,000 |
| MW-16D (Duplicate) | 05/29/96 | Low-Flow | **65.7** | <3.0 | <5.0 | <10.0 | <10.0 | 64.9 | <5.0 | <10.0 | <50.0 | <20.0 | <10.0 | <40.0 | <300 | <1,000 | <50.0 | 333 | 0.79 | **4,400** |
| | 06/12/96 | Dissolved Metals (0.045) | **74.7** | <3.0 | NS | NS | NS | NS | NS | NS | NS | NS | <10.0 | NS | NS | NS | NS | <50.0 | NS | NS |
| MW-17S | 05/29/96 | Low-Flow | 37.4 | <3.0 | <5.0 | <10.0 | <10.0 | 63.9 | <5.0 | <10.0 | <50.0 | <20.0 | 21.7 | <40.0 | <300 | <1,000 | <50.0 | 261 | <0.20 | 2,000 |
| | 06/12/96 | Dissolved Metals (0.045) | **268** | <3.0 | NS | NS | NS | NS | NS | NS | NS | NS | <10.0 | NS | NS | NS | NS | <50.0 | NS | NS |
| MW-17D | 05/29/96 | Low-Flow | **599** | <3.0 | <5.0 | <10.0 | <10.0 | 124 | <5.0 | <10.0 | <50.0 | <20.0 | <10.0 | <40.0 | <300 | <1,000 | <50.0 | <50.0 | <0.20 | **7,400** |
| | 06/12/96 | Dissolved Metals (0.045) | **1040** | <3.0 | NS | NS | NS | NS | NS | NS | NS | NS | <10.0 | NS | NS | NS | NS | <50.0 | NS | NS |

NOTES:
Analytical result shaded where result exceeds established MCL.

Table 4-20. Analytical Results for Revised Groundwater Quality Assessment Monitoring, Samples Collected June 12, 1996, Federated Metals, Hammond, Indiana.

| | | | | PARAMETERS | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Laboratory ID | Sample I.D. | Location | Date | pH | Conductivity umhos/cm | Dissolved Arsenic | Dissolved Lead | Dissolved Copper | Dissolved Zinc |
| A6F130124-001 | FMGWMW15S | MW-15S | 06/12/96 | 6.82 | 652 | 16.5 | <3.0 | <10.0 | 184 |
| A6F130124-002 | FMGWMW107 | MW-15S (Duplicate) | 06/12/96 | NM | NM | 13.1 | <3.0 | <10.0 | 155 |
| A6F130124-003 | FMGWMW16S (MS/MSD) | MW-16S | 06/12/96 | NM | NM | 8.1 | <3.0 | <10.0 | <50.0 |
| A6F130124-004 | FMGWMW16D | MW-16D | 06/12/96 | NM | NM | 74.7 | <3.0 | <10.0 | <50.0 |
| A6F130124-005 | FMGWMW17S | MW-17S | 06/12/96 | NM | NM | 268 | <3.0 | <10.0 | <50.0 |
| A6F130124-006 | FMGWMW17D | MW-17D | 06/12/96 | NM | NM | 1040 | <3.0 | <10.0 | <50.0 |
| A6F130124-007 | FMGWMW108 | Equipment Blank | 06/12/96 | NM | NM | <5.0 | <3.0 | <10.0 | <50.0 |

Notes:
Parameters for pH and conductivity measured in the field.
Groundwater samples field-filtered using 0.45 micron disposable filters.
Samples for dissolved metals analyzed by Quanterra, Inc., North Canton, Ohio.
Analysis for dissolved metals by USEPA SW-846 Method 6010A.
Analytical results for metals reported in ug/L.
NM - not measured, field unit for measuring pH and conductivity failed.

Table 4-22. Analytical Results for Temporary Sampling Points (TSPs), Revised Groundwater Quality Assessment Monitoring, Off-site Samples Collected September 3, through September 27, 1996, Federated Metals, Hammond, Indiana.

| Laboratory ID | Sample I.D. | Location | TSP Screened Interval (bgl) | Date | Fluoride | Dissolved Arsenic | Dissolved Zinc |
|---|---|---|---|---|---|---|---|
| 20733A | FMGWTSP-1S | TSP-1 | 9.3' - 10.8' | 09/03/96 | 360 | <5 | 50 |
| 20733B | FMGWTSP-1D | TSP-1 | 18.3' - 19.8' | 09/03/96 | 530 | 23.5 | <50 |
| 20751A | FMGWTSP-2S | TSP-2 | 8.75' - 10.25' | 09/04/96 | 570 | 36.9 | <50 |
| 20751B | FMGWTSP-2D | TSP-2 | 19.75' - 21.25' | 09/04/96 | 370 | 88.6 | <50 |
| 20751C | FMGWTSP-3S | TSP-3 | 9.25' - 10.75' | 09/04/96 | 530 | 28.2 | <50 |
| 20751D | FMGWTSP-99S | TSP-3 (Duplicate) | 9.25' - 10.75' | 09/04/96 | 620 | 27.8 | <50 |
| 20751E | FMGWTSP-3D | TSP-3 | 21.25' - 22.75' | 09/04/96 | 370 | 30.3 | <50 |
| 20751F | FMGWTSP-4S | TSP-4 | 9.25' - 10.75' | 09/04/96 | 530 | 8.2 | <50 |
| 20751G | FMGWTSP-4D | TSP-4 | 22.25' - 23.75' | 09/04/96 | 450 | 30.9 | <50 |
| 20761A | FMGWTSP-5S | TSP-5 | 9.25' - 10.75' | 09/05/96 | 580 | <5 | <50 |
| 20761B | FMGWTSP-5D | TSP-5 | 24.25' - 25.75' | 09/05/96 | 340 | 23.5 | <50 |
| 20776A | FMGWTSP-6S | TSP-6 | 9.25' - 10.75' | 09/06/96 | 690 | <5 | <50 |
| 20776B | FMGWTSP-6D | TSP-6 | 24.75' - 26.25' | 09/06/96 | 300 | 34.4 | <50 |
| 20776C | FMGWTSP-7S | TSP-7 | 9.25' - 10.75' | 09/06/96 | 620 | <5 | <50 |
| 20776D | FMGWTSP-7D | TSP-7 | 19.25' - 20.75' | 09/06/96 | 240 | 30.5 | <50 |
| 20776E | FMGWTSP-8S | TSP-8 | 8.25' - 9.75' | 09/06/96 | 620 | <5 | <50 |
| 20776F | FMGWTSP-8D | TSP-8 | 19.75' - 21.25' | 09/06/96 | 340 | 21.3 | <50 |
| 20950A | FMGWTSP-11S | TSP-11 | 10.9'-12.4' | 09/24/96 | 840 | <5 | <50 |
| 20950B | FMGWTSP-11D | TSP-11 | 26.0'-27.5' | 09/24/96 | 200 | 14.1 | <50 |
| 20950C | FMGWTSP-12D | TSP-12 | 25.5'-27.0' | 09/24/96 | <200 | 20.4 | <50 |
| 20950D | FMGWTSP-13D | TSP-13 | 26.0'-27.5' | 09/25/96 | 270 | 23.3 | <50 |
| 20965A | FMGWTSP-14D | TSP-14 | 20.1'-21.6' | 09/25/96 | 350 | 11.4 | <50 |
| 20965B | FMGWTSP-15D | TSP-15 | 18.8'-20.3' | 09/25/96 | 200 | 19.6 | <50 |
| 20982A | FMGWTSP-16S | TSP-16 | 8.1'-9.6' | 09/27/96 | 520 | <5 | <50 |
| 20982B | FMGWTSP-16D | TSP-16 | 17.7'-19.2' | 09/27/96 | 340 | 35.5 | <50 |
| 20965C | FMGWTSP-17S | TSP-17 | 8.1'-9.6' | 09/26/96 | 840 | <5 | <50 |
| 20965D | FMGWTSP-17D | TSP-17 | 18.55'-20.05' | 09/26/96 | 440 | 12.4 | <50 |
| 20965G | FMGWTSP-98D | TSP-17 (Duplicate) | 18.55'-20.05' | 09/26/96 | 410 | 12.4 | <50 |
| 20982C | FMGWTSP-18S | TSP-18 | 8.0'-9.5' | 09/27/96 | 540 | 54 | <50 |
| 20982D | FMGWTSP-18D | TSP-18 | 19.8'-21.3' | 09/27/96 | 270 | 35.7 | <50 |
| 20965E | FMGWTSP-19S | TSP-19 | 9.2'-10.7' | 09/26/96 | 310 | <5 | <50 |
| 20965F | FMGWTSP-19D | TSP-19 | 20.1'-21.6' | 09/26/96 | 550 | 7.8 | <50 |
| 20982E | FMGWTSP-20S | TSP-20 | 8.8'-10.3' | 09/27/96 | 540 | <5 | <50 |
| 20982F | FMGWTSP-20D | TSP-20 | 22.0'-23.5' | 09/27/96 | 200 | 41.5 | <50 |

Notes:
Groundwater samples for dissolved metals were field-filtered using 0.45 micron disposable filters.
Samples for dissolved metals and fluoride analyzed by Microbac Laboratories, Inc., Hammond, Indiana.
Analysis for arsenic by USEPA SW-846 Method 3113B.
Analysis for zinc by USEPA SW-846 Method 3111B.
Analysis for fluoride by Method 340.2.
Analytical results reported in ug/L.
bgl - below ground level.

Table 4-23. Surface Water Analytical Results/Lake George Sampling, Volitale Organic Compounds, Federated Metals, Hammond, Indiana

GC/MS VOLATILE SAMPLE DATA (Cont'd.)

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | cis-1,3-Dichloropropene | trans-1,3-Dichloropropene | 1,4-Dioxane | Ethylbenzene | Ethyl methacrylate | 2-Hexanone | Iodomethane | Isobutyl alcohol | Methacrylonitrile | Methylene chloride | Methyl methacrylate | 4-Methyl-2-pentanone (MIBK) | Propionitrile | Styrene | 1,1,1,2-Tetrachloroethane | 1,1,2,2-Tetrachloroethane | Tetrachloroethene | Toluene | 1,1,1-Trichloroethane | 1,1,2-Trichloroethane | Trichloroethene | Trichlorofluoromethane | 1,2,3-Trichloropropane | Vinyl acetate | Vinyl chloride | Xylenes, Total | 1,2-Dichloroethene (Total) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A6F080118-005 | FMSWNS43+40 | NS43 +40 | 6/6/96 | <5.0 | <5.0 | <1,000 | <5.0 | <5.0 | <50 | <5.0 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A6F080118-001 | FMSWNS43+80 (0-1) | NS43 +80 (0-1') | 6/6/96 | <5.0 | <5.0 | <1,000 | <5.0 | <5.0 | <50 | <5.0 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A6F080118-002 | FMSWNS43+80 (1.5-2.5) | NS43 +80 (1.5-2.5') | 6/6/96 | <5.0 | <5.0 | <1,000 | <5.0 | <5.0 | <50 | <5.0 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A6F070137-001 | FMSWNS44+5 | NS44 +5 | 6/5/96 | <5.0 | <5.0 | <1,000R | <5.0 | <5.0 | <50 | <5.0 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A6F070137-002 | FMSWNS44+40 | NS44 +40 | 6/5/96 | <5.0 | <5.0 | <1,000R | <5.0 | <5.0 | <50 | <5.0 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A6F070137-003 | FMSWNS44+80 | NS44 +80 | 6/5/96 | <5.0 | <5.0 | <1,000R | <5.0 | <5.0 | <50 | <5.0 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A6F070137-009 | FMSWNS45+5 | NS45 +5 | 6/5/96 | <5.0 | <5.0 | <1,000R | <5.0 | <5.0 | <50 | <5.0 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A6F070137-008 | FMSWNS45+40 | NS45 +40 | 6/5/96 | <5.0 | <5.0 | <1,000R | <5.0 | <5.0 | <50 | <5.0 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A6F070137-007 | FMSWNS45+80 | NS45 +80 | 6/5/96 | <5.0 | <5.0 | <1,000R | <5.0 | <5.0 | <50 | <5.0 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A6F070137-004 | FMSWNS46+5 | NS46 +5 | 6/5/96 | <5.0 | <5.0 | <1,000R | <5.0 | <5.0 | <50 | <5.0 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A6F070137-006 | FMSWNS100+5 | NS46 +5 (Duplicate) | 6/5/96 | <5.0 | <5.0 | <1,000R | <5.0 | <5.0 | <50 | <5.0 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A6F070137-005 | FMSWNS46+40 | NS46 +40 | 6/5/96 | <5.0 | <5.0 | <1,000R | <5.0 | <5.0 | <50 | <5.0 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A6F080118-009 | FMSWNS101 | Equipment Blank | 6/6/96 | <5.0 | <5.0 | <1,000 | <5.0 | <5.0 | <50 | <5.0 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A6F070137-010 | TRIP BLANK | TRIP BLANK | 6/5/96 | <5.0 | <5.0 | <1,000R | <5.0 | <5.0 | <50 | <5.0 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A6F080118-010 | TRIP BLANK | Trip Blank | 6/6/96 | <5.0 | <5.0 | <1,000 | <5.0 | <5.0 | <50 | <5.0 | <500 | <20 | <5.0 | <5.0 | <50 | <20 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |

Notes:
Samples analyzed by Quanterra, Inc., North Canton, Ohio.
Samples for volatile organics by GC/MS (SW 846 8240B)
Analytical results reported in ug/L.
J - Estimated value (detected) but below quantitation limit.
UJ - Estimated and not detected value based on data validation
R - Rejected value based on data validation

Table 4-24. Surface Water Analytical Results/Lake George Sampling, Semi-Volatile Organic Compounds, Federated Metals, Hammond, Indiana

**GC/MS SEMIVOLATILE SAMPLE DATA (Cont'd.)**

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Benzyl alcohol | bis(2-Chloroethoxy) methane | bis(2-Chloroethyl) ether | bis(2-Chloro-1-methylethyl) ether | bis(2-Ethylhexyl)phthalate | 4-Bromophenyl phenyl ether | Butyl benzyl phthalate | 4-Chloroaniline | 4-Chloro-3-methylphenol | 2-Chloronaphthalene | 2-Chlorophenol | 4-Chlorophenyl phenyl ether | Chrysene | Dibenz(a,h)anthracene | Dibenzofuran | Di-n-butyl phthalate | 1,2-Dichlorobenzene | 1,3-Dichlorobenzene | 1,4-Dichlorobenzene | 3,3'-Dichlorobenzidine |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A6F080118-005 | FMSWNS43+40 | NS43 +40 | 6/6/96 | <10UJ | <10 | <10 | <10 | <10UJ | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| A6F080118-001 | FMSWNS43+80 (0-1) | NS43 +80 (0-1') | 6/6/96 | <10UJ | <10 | <10 | <10 | <10UJ | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| A6F080118-002 | FMSWNS43+80 (1.5-2.5) | NS43 +80 (1.5-2.5') | 6/6/96 | <10UJ | <10 | <10 | <10 | **6.7UJ** | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| A6F070137-001 | FMSWNS44+5 | NS44 +5 | 6/5/96 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| A6F070137-002 | FMSWNS44+40 | NS44 +40 (original) | 6/5/96 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| A6F070137-002 | FMSWNS44+40 | NS44 +40 (reanalysis) | 6/5/96 | <10UJ | <10UJ | <10UJ | <10UJ | <10UJ | <10UJ | <10UJ | <10UJ | <10UJ | <10UJ | <10UJ | <10UJ | <10UJ | <10UJ | <10UJ | <10UJ | <10UJ | <10UJ | <10UJ | <10UJ | <10UJ |
| A6F070137-003 | FMSWNS44+80 | NS44 +80 | 6/5/96 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| A6F070137-009 | FMSWNS45+5 | NS45 +5 | 6/5/96 | <10 | <10 | <10 | <10 | **6.7J** | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| A6F070137-008 | FMSWNS45+40 | NS45 +40 | 6/5/96 | <10 | <10 | <10 | <10 | **6.7J** | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| A6F070137-007 | FMSWNS45+80 | NS45 +80 | 6/5/96 | <10 | <10 | <10 | <10 | **6.7J** | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| A6F070137-004 | FMSWNS46+5 | NS46 +5 | 6/5/96 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| A6F070137-006 | FMSWNS100+5 | NS46 +5 (Duplicate) | 6/5/96 | <10 | <10 | <10 | <10 | **7.1J** | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| A6F070137-005 | FMSWNS46+40 | NS46 +40 | 6/5/96 | <10 | <10 | <10 | <10 | **6.7J** | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| A6F080118-009 | FMSWNS101 | Equipment Blank | 6/6/96 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |

Notes:

Samples analyzed by Quanterra, Inc., North Canton, Ohio.
Samples for semi-volatile organics by GC/MS (SW 846 8270B)
Analytical results reported in ug/L.
Sample FMSWNS44+40 (original) exhibited surrogate recoveries outside laboratory acceptance criteria
Upon reextraction of Sample FMSWNS44+40 (reanalysis), surrogate recoveries were within laboratory acceptance criteria, however, sample holding times had been exceeded.
J - Estimated value (detected) but below quantitation limit.
UJ - Estimated and not detected value based on data validation
R - Rejected value based on data validation
Bis(2-ethylhexyl) phthalate was detected in the GC/MS Semi-Volatiles Method Blank (laboratory contaminant).

Table 4-24. Surface Water Analytical Results/Lake George Sampling, Semi-Volatile Organic Compounds, Federated Metals, Hammond, Indiana

**GC/MS SEMIVOLATILE SAMPLE DATA (Cont'd.)**

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | Indeno(1,2,3-cd)pyrene | Isophorone | Isosafrole | Methapyrilene | o-Toluidine | 3-Methylcholanthrene | Methyl methanesulfonate | 2-Methylnaphthalene | 2-Methylphenol | 3-Methylphenol | 4-Methylphenol | Naphthalene | 1,4-Naphthoquinone | 1-Naphthylamine | 2-Naphthylamine | 2-Nitroaniline | 3-Nitroaniline | 4-Nitroaniline | Nitrobenzene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A6F080118-005 | FMSWNS43+40 | NS43 +40 | 6/6/96 | <10 | <10 | <10 | <100UJ | <20 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <200 | <10 | <10 | <50 | <50 | <50 | <10 |
| A6F080118-001 | FMSWNS43+80 (0-1) | NS43 +80 (0-1') | 6/6/96 | <10 | <10 | <10 | <100UJ | <20 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <200 | <10 | <10 | <50 | <50 | <50 | <10 |
| A6F080118-002 | FMSWNS43+80 (1.5-2.5) | NS43 +80 (1.5-2.5') | 6/6/96 | <10 | <10 | <10 | <100UJ | <20 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <200 | <10 | <10 | <50 | <50 | <50 | <10 |
| A6F070137-001 | FMSWNS44+5 | NS44 +5 | 6/5/96 | <10 | <10 | <10 | <100 | <20 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <200 | <10 | <10 | <50 | <50 | <50 | <10 |
| A6F070137-002 | FMSWNS44+40 | NS44 +40 (original) | 6/5/96 | <10 | <10 | <10 | <100 | <20 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <200 | <10 | <10 | <50 | <50 | <50 | <10 |
| A6F070137-002 | FMSWNS44+40 | NS44 +40 (reanalysis) | 6/5/96 | <10UJ | <10UJ | <10UJ | <100R | <20UJ | <100UJ | <10UJ | <10UJ | <10UJ | <10UJ | <10UJ | <10UJ | <200UJ | <10UJ | <10UJ | <50UJ | <50UJ | <50UJ | <10UJ |
| A6F070137-003 | FMSWNS44+80 | NS44 +80 | 6/5/96 | <10 | <10 | <10 | <100 | <20 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <200 | <10 | <10 | <50 | <50 | <50 | <10 |
| A6F070137-009 | FMSWNS45+5 | NS45 +5 | 6/5/96 | <10 | <10 | <10 | <100 | <20 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <200 | <10 | <10 | <50 | <50 | <50 | <10 |
| A6F070137-008 | FMSWNS45+40 | NS45 +40 | 6/5/96 | <10 | <10 | <10 | <100 | <20 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <200 | <10 | <10 | <50 | <50 | <50 | <10 |
| A6F070137-007 | FMSWNS45+80 | NS45 +80 | 6/5/96 | <10 | <10 | <10 | <100 | <20 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <200 | <10 | <10 | <50 | <50 | <50 | <10 |
| A6F070137-004 | FMSWNS46+5 | NS46 +5 | 6/5/96 | <10 | <10 | <10 | <100 | <20 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <200 | <10 | <10 | <50 | <50 | <50 | <10 |
| A6F070137-006 | FMSWNS100+5 | NS46 +5 (Duplicate) | 6/5/96 | <10 | <10 | <10 | <100 | <20 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <200 | <10 | <10 | <50 | <50 | <50 | <10 |
| A6F070137-005 | FMSWNS46+40 | NS46 +40 | 6/5/96 | <10 | <10 | <10 | <100 | <20 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <200 | <10 | <10 | <50 | <50 | <50 | <10 |
| A6F080118-009 | FMSWNS101 | Equipment Blank | 6/6/96 | <10 | <10 | <10 | <100 | <20 | <100 | <10 | <10 | <10 | <10 | <10 | <10 | <200 | <10 | <10 | <50 | <50 | <50 | <10 |

Notes:

Samples analyzed by Quanterra, Inc., North Canton, Ohio.
Samples for semi-volatile organics by GC/MS (SW 846 8270B)
Analytical results reported in ug/L.
Sample FMSWNS44+40 (original) exhibited surrogate recoveries outside laboratory acceptance criteria
Upon reextraction of Sample FMSWNS44+40 (reanalysis), surrogate recoveries were within laboratory acceptance criteria, however, sample holding times had been exceeded.
J - Estimated value (detected) but below quantitation limit.
UJ - Estimated and not detected value based on data validation
R - Rejected value based on data validation
Bis(2-ethylhexyl) phthalate was detected in the GC/MS Semi-Volatiles Method Blank (laboratory contaminant).

Table 4-24. Surface Water Analytical Results/Lake George Sampling, Semi-Volatile Organic Compounds, Federated Metals, Hammond, Indiana

GC/MS SEMIVOLATILE SAMPLE DATA (Cont'd.)

| Laboratory I.D. | Sample I.D. | Sample Location | Date Sampled | 2-Picoline | Pyrene | Pyridine | Safrole | 1,2,4,5-Tetrachlorobenzene | 2,3,4,6-Tetrachlorophenol | 1,2,4-Trichlorobenzene | 2,4,5-Trichlorophenol | 2,4,6-Trichlorophenol | 1,3,5-Trinitrobenzene | Aramite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A6F080118-005 | FMSWNS43+40 | NS43 +40 | 6/6/96 | <20 | <10 | <10UJ | <10 | <10 | <50 | <10 | <10 | <10 | <50 | <50 |
| A6F080118-001 | FMSWNS43+80 (0-1) | NS43 +80 (0-1') | 6/6/96 | <20 | <10 | <10UJ | <10 | <10 | <50 | <10 | <10 | <10 | <50 | <50 |
| A6F080118-002 | FMSWNS43+80 (1.5-2.5) | NS43 +80 (1.5-2.5') | 6/6/96 | <20 | <10 | <10UJ | <10 | <10 | <50 | <10 | <10 | <10 | <50 | <50 |
| A6F070137-001 | FMSWNS44+5 | NS44 +5 | 6/5/96 | <20 | <10 | <10 | <10R | <10 | <50 | <10 | <10 | <10 | <50 | <50 |
| A6F070137-002 | FMSWNS44+40 | NS44 +40 (original) | 6/5/96 | <20 | <10 | <10 | <10 | <10 | <50 | <10 | <10 | <10 | <50 | <50 |
| A6F070137-002 | FMSWNS44+40 | NS44 +40 (reanalysis) | 6/5/96 | <20UJ | <10UJ | <10UJ | <10UJ | <10UJ | <50UJ | <10UJ | <10UJ | <10UJ | <50UJ | <50UJ |
| A6F070137-003 | FMSWNS44+80 | NS44 +80 | 6/5/96 | <20 | <10 | <10 | <10 | <10 | <50 | <10 | <10 | <10 | <50 | <50 |
| A6F070137-009 | FMSWNS45+5 | NS45 +5 | 6/5/96 | <20 | <10 | <10 | <10 | <10 | <50 | <10 | <10 | <10 | <50 | <50 |
| A6F070137-008 | FMSWNS45+40 | NS45 +40 | 6/5/96 | <20 | <10 | <10 | <10 | <10 | <50 | <10 | <10 | <10 | <50 | <50 |
| A6F070137-007 | FMSWNS45+80 | NS45 +80 | 6/5/96 | <20 | <10 | <10 | <10 | <10 | <50 | <10 | <10 | <10 | <50 | <50 |
| A6F070137-004 | FMSWNS46+5 | NS46 +5 | 6/5/96 | <20 | <10 | <10 | <10 | <10 | <50 | <10 | <10 | <10 | <50 | <50 |
| A6F070137-006 | FMSWNS100+5 | NS46 +5 (Duplicate) | 6/5/96 | <20 | <10 | <10 | <10 | <10 | <50 | <10 | <10 | <10 | <50 | <50 |
| A6F070137-005 | FMSWNS46+40 | NS46 +40 | 6/5/96 | <20 | <10 | <10 | <10 | <10 | <50 | <10 | <10 | <10 | <50 | <50 |
| A6F080118-009 | FMSWNS101 | Equipment Blank | 6/6/96 | <20 | <10 | <10 | <10 | <10 | <50 | <10 | <10 | <10 | <50 | <50 |

Notes:

Samples analyzed by Quanterra, Inc., North Canton, Ohio.
Samples for semi-volatile organics by GC/MS (SW 846 8270B)
Analytical results reported in ug/L.
Sample FMSWNS44+40 (original) exhibited surrogate recoveries outside laboratory acceptance criteria
Upon reextraction of Sample FMSWNS44+40 (reanalysis), surrogate recoveries were within laboratory acceptance criteria, however, sample holding times had been exceeded.
J - Estimated value (detected) but below quantitation limit.
UJ - Estimated and not detected value based on data validation
R - Rejected value based on data validation
Bis(2-ethylhexyl) phthalate was detected in the GC/MS Semi-Volatiles Method Blank (laboratory contaminant).

Table 4-26. Sediment Analytical Results/Lake George Sampling, Volatile Organic Compounds, Federated Metals, Hammond, Indiana.

| | | | | GC/MS VOLATILE SAMPLE DATA | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory I.D. | Sample I.D. | Sample Location and Sample Depth | Date Sampled | Acetone | Acetonitirile | Acrolein | Acrylonitrile | Allyl Chloride | Benzene | Bromodicloromethane | Bromoform | Bromomethane | 2-Butanone (MEK) | Carbon disulfide | Carbon Tetrachloride | Chlorobenzene | Chloroethane | Chloroform | Chloromethane | Chloroprene | Dibromochloromethane | 1,2-Dibromo-3-chloro-propane | 1,2-Dibromoethane | Dibromomethane | trans-1,4-Dichloro-2-butene | Dichlorodifluoromethane | 1,1-Dichloroethane |
| A6F130119-001 | FMSEDNS43+5 (0-0.5) | NS43 +5 (0-0.5') | 6/11/96 | 79UJ | <360 | <730R | <360 | <36 | <36 | <36 | <73 | <73 | <360UJ | <36 | <73 | <36 | <73 | <36 | <73 | <36 | <36 | <73 | <36 | <36 | <36 | <150 | <36 |
| A6F080118-006 | FMSEDNS43+5 (1-1.5) | NS43 +5 (1-1.5') | 6/6/96 | 19J | <86 | <170R | <86 | <8.6 | <8.6 | <8.6 | <17 | <17 | <86UJ | <8.6 | <17 | <8.6 | <17 | <8.6 | <17 | <8.6 | <8.6 | <17UJ | <8.6 | <8.6 | <8.6 | <34 | <8.6 |
| A6F080118-007 | FMSEDNS43+20 (0.5-2) | NS43 +20 (0.5-2') | 6/6/96 | <90 | <90 | <180R | <90 | <9.0 | <9.0UJ | <9.0UJ | <18UJ | <18 | <90UJ | <9.0 | <18UJ | <9.0 | <18 | <9.0 | <18 | <9.0 | <9.0UJ | <18UJ | <9.0 | <9.0 | <9.0 | <36 | <9.0 |
| A6F080118-008 | FMSEDNS43+40 (0-1) | NS43 +40 (0-1') | 6/6/96 | 35J | <74 | <150R | <74 | <7.4 | <7.4 | <7.4 | <15 | <15 | <74UJ | <7.4 | <15 | <7.4 | <15 | <7.4 | <15 | <7.4 | <7.4 | <15UJ | <7.4 | <7.4 | <7.4 | <29 | <7.4 |
| A6F080118-003 | FMSEDNS43+80 (0-1) | NS43 +80 (0-1') | 6/6/96 | 38J | <110 | <220R | <110 | <11 | <11 | <11 | <22 | <22 | <110UJ | <11 | <22 | <11 | <22 | <11 | <22 | <11 | <11 | <22UJ | <11 | <11 | <11 | <44 | <11 |
| A6F080118-004 | FMSEDNS43+80 (1-1.5) | NS43 +80 (1-1.5') | 6/6/96 | 10J | <72 | <140R | <72 | <7.2 | <7.2 | <7.2 | <14 | <14 | <72UJ | <7.2 | <14 | <7.2 | <14 | <7.2 | <14 | <7.2 | <7.2 | <14UJ | <7.2 | <7.2 | <7.2 | <29 | <7.2 |
| A6F130119-010 | FMSEDNS44+5 (0-0.5) | NS44 +5 (0-0.5') | 6/11/96 | <180 | <180 | <360R | <180 | <18 | <18 | <18 | <36 | <36 | <180UJ | <18 | <36 | <18 | <36UJ | <18 | <36 | <18 | <18 | <36 | <18 | <18 | <18 | <72 | <18 |
| A6F080118-023 | FMSEDNS44+5 (0.5-1.5) | NS44 +5 (0.5-1.5') | 6/7/96 | <63 | <63 | <130R | <63UJ | <6.3 | <6.3 | <6.3 | <13 | <13 | <63UJ | <6.3 | <13 | <6.3 | <13 | <6.3 | <13UJ | <6.3 | <6.3 | <13 | <6.3 | <6.3 | <6.3 | <25 | <6.3 |
| A6F130119-011 | FMSEDNS44+20 (0-0.5) | NS44 +20 (0-0.5') | 6/11/96 | <86 | <86 | <170R | <86 | <8.6 | <8.6 | <8.6 | <17 | <17 | <86UJ | <8.6 | <17 | <8.6 | <17UJ | <8.6 | <17 | <8.6 | <8.6 | <17 | <8.6 | <8.6 | <8.6 | <34 | <8.6 |
| A6F080118-022 | FMSEDNS44+20 (0.5-1.5) | NS44 +20 (0.5-1.5') | 6/7/96 | <67 | <67 | <130R | <67UJ | <6.7 | <6.7 | <6.7 | <13 | <13 | <67UJ | <6.7 | <13 | <6.7 | <13 | <6.7 | <13UJ | <6.7 | <6.7 | <13 | <6.7 | <6.7 | <6.7 | <27 | <6.7 |
| A6F130119-012 | FMSEDNS44+40 (0-0.5) | NS44 +40 (0-0.5') | 6/11/96 | <110 | <110 | <230R | <110 | <11 | <11 | <11 | <23 | <23 | <110UJ | <11 | <23 | <11 | <23UJ | <11 | <23 | <11 | <11 | <23 | <11 | <11 | <11 | <46 | <11 |
| A6F080118-021 | FMSEDNS44+40 (0.5-1.5) | NS44 +40 (0.5-1.5') | 6/7/96 | <67 | <67 | <130R | <67UJ | <6.7 | <6.7 | <6.7 | <13 | <13 | <67UJ | <6.7 | <13 | <6.7 | <13 | <6.7 | <13UJ | <6.7 | <6.7 | <13 | <6.7 | <6.7 | <6.7 | <27 | <6.7 |
| A6F130119-013 | FMSEDNS44+80 (0-0.5) | NS44 +80 (0-0.5') | 6/11/96 | <160 | <160 | <320R | <160 | <16 | <16 | <16 | <32 | <32 | <160UJ | <16 | <32 | <16 | <32UJ | <16 | <32 | <16 | <16 | <32 | <16 | <16 | <16 | <63 | <16 |
| A6F080118-020 | FMSEDNS44+80 (0.5-1.5) | NS44 +80 (0.5-1.5') | 6/7/96 | <68 | <68 | <140R | <68UJ | <6.8 | <6.8 | <6.8 | <14 | <14 | <68UJ | <6.8 | <14 | <6.8 | <14 | <6.8 | <14UJ | <6.8 | <6.8 | <14 | <6.8 | <6.8 | <6.8 | <27 | <6.8 |
| A6F130119-002 | FMSEDNS45+5 (0-0.5) | NS45 +5 (0-0.5') | 6/11/96 | <200 | <200 | <400R | <200 | <20 | <20 | <20 | <40 | <40 | <200UJ | <20 | <40 | <20 | <40UJ | <20 | <40 | <20 | <20 | <40 | <20 | <20 | <20 | <79 | <20 |
| A6F080118-015 | FMSEDNS45+5 (0.5-1.5) | NS45 +5 (0.5-1.5') | 6/7/96 | <81 | <81 | <160R | <81UJ | <8.1 | <8.1 | <8.1 | <16 | <16 | <81UJ | 5.4J | <16 | <8.1 | <16 | <8.1 | <16UJ | <8.1 | <8.1 | <16UJ | <8.1 | <8.1 | <8.1 | <32 | <8.1 |
| A6F130119-003 | FMSEDNS45+20 (0-0.5) | NS45 +20 (0-0.5') | 6/11/96 | 32UJ | <220 | <450R | <220 | <22 | <22 | <22 | <45 | <45 | <220UJ | <22 | <45 | <22 | <45 | <22 | <45 | <22 | <22 | <45 | <22 | <22 | <22 | <89 | <22 |
| A6F080118-013 | FMSEDNS45+20 (0.5-1.5) | NS45 +20 (0.5-1.5') | 6/7/96 | <70 | <70 | <140R | <70 | <7.0 | <7.0 | <7.0 | <14 | <14 | <70UJ | <7.0 | <14 | <7.0 | <14 | <7.0 | <14 | <7.0 | <7.0 | <14UJ | <7.0 | <7.0 | <7.0 | <28 | <7.0 |
| A6F080118-014 | FMSEDNS45+103 (0.5-1.5) | NS45+ 20 (0.5-1.5')Dup. | 6/7/96 | <64 | <64 | <130R | <64 | <6.4 | <6.4 | <6.4 | <13 | <13 | <64UJ | <6.4 | <13 | <6.4 | <13 | <6.4 | <13 | <6.4 | <6.4 | <13UJ | <6.4 | <6.4 | <6.4 | <25 | <6.4 |
| A6F130119-004 | FMSEDNS45+40 (0-0.5) | NS45 +40 (0-0.5') | 6/11/96 | <220 | <220 | <430R | <220 | <22 | <22 | <22 | <43 | <43 | <220UJ | <22 | <43 | <22 | <43UJ | <22 | <43 | <22 | <22 | <43 | <22 | <22 | <22 | <87 | <22 |
| A6F080118-012 | FMSEDNS45+40 (0.5-1.5) | NS45 +40 (0.5-1.5') | 6/7/96 | <82 | <82 | <160R | <82 | <8.2 | <8.2 | <8.2 | <16 | <16 | <82UJ | <8.2 | <16 | <8.2 | <16 | <8.2 | <16 | <8.2 | <8.2 | <16UJ | <8.2 | <8.2 | <8.2 | <33 | <8.2 |
| A6F130119-005 | FMSEDNS45+80 (0-0.5) MS/MSD | NS45 +80 (0-0.5') | 6/11/96 | 33UJ | <220 | <430R | <220 | <22 | <22 | <22 | <43 | <43 | <220UJ | <22 | <43 | <22 | <43 | <22 | <43 | <22 | <22 | <43 | <22 | <22 | <22 | <87 | <22 |
| A6F080118-011 | FMSEDNS45+80 (0.5-1.5) | NS45 +80 (0.5-1.5') | 6/7/96 | 16J | <70UJ | <140R | <70 | <7.0 | <7.0 | <7.0 | <14 | <14 | <70UJ | <7.0 | <14 | <7.0 | <14 | <7.0 | <14UJ | <7.0 | <7.0 | <14 | <7.0 | <7.0 | <7.0 | <28 | <7.0 |
| A6F130119-006 | FMSEDNS46+5 (0-0.5) | NS46 +5 (0-0.5') | 6/11/96 | <220 | <220 | <430R | <220 | <22 | <22 | <22 | <43 | <43 | <220UJ | <22 | <43 | <22 | <43UJ | <22 | <43 | <22 | <22 | <43 | <22 | <22 | <22 | <87 | <22 |
| A6F080118-019 | FMSEDNS46+5 (0.5-1.5) | NS46 +5 (0.5-1.5') | 6/7/96 | 9.4J | <61 | <120R | <61UJ | <6.1 | <6.1 | <6.1 | <12 | <12 | <61UJ | <6.1 | <12 | <6.1 | <12 | <6.1 | <12UJ | <6.1 | <6.1 | <12 | <6.1 | <6.1 | <6.1 | <24 | <6.1 |
| A6F130119-007 | FMSEDNS46+20 (0-0.5) | NS46 +20 (0-0.5') | 6/11/96 | 47UJ | <270 | <550R | <270 | <27 | <27 | <27 | <55 | <55 | <270UJ | <27 | <55 | <27 | <55UJ | <27 | <55 | <27 | <27 | <55 | <27 | <27 | <27 | <110 | <27 |
| A6F130119-014 | FMSEDNS104+20 (0-0.5) | NS46 +20 (0-0.5')Dup. | 6/11/96 | 120UJ | <220 | <450R | <220 | <22 | <22 | <22 | <45 | <45 | 50J | <22 | <45 | <22 | <45UJ | <22 | <45 | <22 | <22 | <45 | <22 | <22 | <22 | <89 | <22 |
| A6F080118-018 | FMSEDNS46+20 (0.5-1.5) | NS46 +20 (0.5-1.5') | 6/7/96 | <80 | <80 | <160R | <80UJ | <8.0 | <8.0 | <8.0 | <16 | <16 | <80UJ | <8.0 | <16 | <8.0 | <16 | <8.0 | <16UJ | <8.0 | <8.0 | <16 | <8.0 | <8.0 | <8.0 | <32 | <8.0 |
| A6F130119-008 | FMSEDNS46+40 (0-0.5) | NS46 +40 (0-0.5') | 6/11/96 | <170 | <170 | <340R | <170 | <17 | <17 | <17 | <34 | <34 | <170UJ | <17 | <34 | <17 | <34 | <17 | <34 | <17 | <17 | <34 | <17 | <17 | <17 | <67 | <17 |
| A6F080118-017 | FMSEDNS46+40 (0.5-1.5) | NS46 +40 (0.5-1.5') | 6/7/96 | <68 | <68 | <140R | <68 | <6.8 | <6.8 | <6.8 | <14 | <14 | <68UJ | <6.8 | <14 | <6.8 | <14 | <6.8 | <14 | <6.8 | <6.8 | <14UJ | <6.8 | <6.8 | <6.8 | <27 | <6.8 |
| A6F130119-009 | FMSEDNS46+80 (0-0.5) | NS46 +80 (0-0.5') | 6/11/96 | <250 | <250 | <490R | <250 | <25 | <25 | <25 | <49 | <49 | <250UJ | <25 | <49 | <25 | <49UJ | <25 | <49 | <25 | <25 | <49 | <25 | <25 | <25 | <99 | <25 |
| A6F080118-016 | FMSEDNS46+80 (0.5-1.5) | NS46 +80 (0.5-1.5') | 6/7/96 | <62 | <62 | <120R | <62 | <6.2 | <6.2 | <6.2 | <12 | <12 | <62UJ | <6.2 | <12 | <6.2 | <12 | <6.2 | <12 | <6.2 | <6.2 | <12UJ | <6.2 | <6.2 | <6.2 | <25 | <6.2 |
| A6F080118-024 | FMSWNS102 | Equipment Blank | 6/7/96 | <50 | <50 | <100 | <50 | <5.0 | <5.0 | <5.0 | <10 | <10 | <50 | <5.0 | <10 | <5.0 | <10 | <5.0 | <10 | <5.0 | <5.0 | <10 | <5.0 | <5.0 | <5.0 | <20 | <5.0 |
| A6F130119-015 | FMSWNS105 | Equipment Blank | 6/11/96 | 20J | <50 | <100 | <50 | <5.0 | <5.0 | <5.0 | <10 | <10 | <50 | <5.0 | <10 | <5.0 | <10 | <5.0 | <10 | <5.0 | <5.0 | <10 | <5.0 | <5.0 | <5.0 | <20 | <5.0 |
| A6F130119-016 | Trip Blank | Trip Blank | 6/11/96 | <50 | <50 | <100 | <50 | <5.0 | <5.0 | <5.0 | <10 | <10 | <50 | <5.0 | <10 | <5.0 | <10 | <5.0 | <10 | <5.0 | <5.0 | <10 | <5.0 | <5.0 | <5.0 | <20 | <5.0 |

Notes:

Samples analyzed by Quanterra, Inc., North Canton, Ohio.

Samples for volatile organics by GC/MS (SW 846 8240B)

Analytical results reported in ug/kg.

J - Estimated value (detected).

UJ - Estimated and not detected, value based on data validation.

Table 4-26. Sediment Analytical Results/Lake George Sampling, Volatile Organic Compounds, Federated Metals, Hammond, Indiana.

| Laboratory I.D. | Sample I.D. | Sample Location and Sample Depth | Date Sampled | 1,1,2-Trichloroethane | Trichloroethene | Trichlorofluoromethane | 1,2,3-Trichloropropane | Vinyl acetate | Vinyl chloride | Xylenes, Total | 1,2-Dichloroethene (Total) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A6F130119-001 | FMSEDNS43+5 (0-0.5) | NS43 +5 (0-0.5') | 6/11/96 | <36 | <36 | <36UJ | <36 | <360UJ | <73 | <36 | <36 |
| A6F080118-006 | FMSEDNS43+5 (1-1.5) | NS43 +5 (1-1.5') | 6/6/96 | <8.6 | <8.6 | <8.6UJ | <8.6 | <86UJ | <17 | <8.6 | <8.6 |
| A6F080118-007 | FMSEDNS43+20 (0.5-2) | NS43 +20 (0.5-2') | 6/6/96 | <9.0UJ | <9.0UJ | <9.0UJ | <9.0 | <90UJ | <18 | <9.0 | <9.0 |
| A6F080118-008 | FMSEDNS43+40 (0-1) | NS43 +40 (0-1') | 6/6/96 | <7.4 | <7.4 | <7.4UJ | <7.4 | <74UJ | <15 | <7.4UJ | <7.4 |
| A6F080118-003 | FMSEDNS43+80 (0-1) | NS43 +80 (0-1') | 6/6/96 | <11 | <11 | <11UJ | <11 | <110UJ | <22 | <11 | <11 |
| A6F080118-004 | FMSEDNS43+80 (1-1.5) | NS43 +80 (1-1.5') | 6/6/96 | <7.2 | <7.2 | <7.2UJ | <7.2 | <72UJ | <14 | <7.2 | <7.2 |
| A6F130119-010 | FMSEDNS44+5 (0-0.5) | NS44 +5 (0-0.5') | 6/11/96 | <18 | <18 | <18UJ | <18 | <180UJ | <36 | <18 | <18 |
| A6F080118-023 | FMSEDNS44+5 (0.5-1.5) | NS44 +5 (0.5-1.5') | 6/7/96 | <6.3 | <6.3 | <6.3UJ | <6.3 | <63UJ | <13 | <6.3 | <6.3 |
| A6F130119-011 | FMSEDNS44+20 (0-0.5) | NS44 +20 (0-0.5') | 6/11/96 | <8.6 | <8.6 | <8.6UJ | <8.6 | <86UJ | <17 | <8.6 | <8.6 |
| A6F080118-022 | FMSEDNS44+20 (0.5-1.5) | NS44 +20 (0.5-1.5') | 6/7/96 | <6.7 | <6.7 | <6.7UJ | <6.7 | <67UJ | <13 | <6.7 | <6.7 |
| A6F130119-012 | FMSEDNS44+40 (0-0.5) | NS44 +40 (0-0.5') | 6/11/96 | <11 | <11 | <11UJ | <11 | <110UJ | <23 | <11 | <11 |
| A6F080118-021 | FMSEDNS44+40 (0.5-1.5) | NS44 +40 (0.5-1.5') | 6/7/96 | <6.7 | <6.7 | <6.7UJ | <6.7 | <67UJ | <13 | <6.7 | <6.7 |
| A6F130119-013 | FMSEDNS44+80 (0-0.5) | NS44 +80 (0-0.5') | 6/11/96 | <16 | <16 | <16UJ | <16 | <160UJ | <32 | <16 | <16 |
| A6F080118-020 | FMSEDNS44+80 (0.5-1.5) | NS44 +80 (0.5-1.5') | 6/7/96 | <6.8 | <6.8 | <6.8UJ | <6.8 | <68UJ | <14 | <6.8 | <6.8 |
| A6F130119-002 | FMSEDNS45+5 (0-0.5) | NS45 +5 (0-0.5') | 6/11/96 | <20 | <20 | <20UJ | <20 | <200UJ | <40 | <20 | <20 |
| A6F080118-015 | FMSEDNS45+5 (0.5-1.5) | NS45 +5 (0.5-1.5') | 6/7/96 | <8.1 | <8.1 | <8.1UJ | <8.1 | <81UJ | <16 | <8.1 | <8.1 |
| A6F130119-003 | FMSEDNS45+20 (0-0.5) | NS45 +20 (0-0.5') | 6/11/96 | <22 | <22 | <22UJ | <22 | <220UJ | <45 | <22 | <22 |
| A6F080118-013 | FMSEDNS45+20 (0.5-1.5) | NS45 +20 (0.5-1.5') | 6/7/96 | <7.0 | <7.0 | <7.0UJ | <7.0 | <70UJ | <14 | <7.0 | <7.0 |
| A6F080118-014 | FMSEDNS45+103 (0.5-1.5) | NS45+ 20 (0.5-1.5')Dup. | 6/7/96 | <6.4 | <6.4 | <6.4UJ | <6.4 | <64UJ | <13 | <6.4 | <6.4 |
| A6F130119-004 | FMSEDNS45+40 (0-0.5) | NS45 +40 (0-0.5') | 6/11/96 | <22 | <22 | <22UJ | <22 | <220UJ | <43 | <22 | <22 |
| A6F080118-012 | FMSEDNS45+40 (0.5-1.5) | NS45 +40 (0.5-1.5') | 6/7/96 | <8.2 | <8.2 | <8.2UJ | <8.2 | <82UJ | <16 | <8.2 | <8.2 |
| A6F130119-005 | FMSEDNS45+80 (0-0.5) MS/MSD | NS45 +80 (0-0.5') | 6/11/96 | <22 | <22 | <22UJ | <22 | <220UJ | <43 | <22 | <22 |
| A6F080118-011 | FMSEDNS45+80 (0.5-1.5) | NS45 +80 (0.5-1.5') | 6/7/96 | <7.0 | <7.0 | <7.0UJ | <7.0 | <70UJ | <14 | <7.0 | <7.0 |
| A6F130119-006 | FMSEDNS46+5 (0-0.5) | NS46 +5 (0-0.5') | 6/11/96 | <22 | <22 | <22UJ | <22 | <220UJ | <43 | <22 | <22 |
| A6F080118-019 | FMSEDNS46+5 (0.5-1.5) | NS46 +5 (0.5-1.5') | 6/7/96 | <6.1 | <6.1 | <6.1UJ | <6.1 | <61UJ | <12 | <6.1 | <6.1 |
| A6F130119-007 | FMSEDNS46+20 (0-0.5) | NS46 +20 (0-0.5') | 6/11/96 | <27 | <27 | <27UJ | <27 | <270UJ | <55 | <27 | <27 |
| A6F130119-014 | FMSEDNS104+20 (0-0.5) | NS46 +20 (0-0.5')Dup. | 6/11/96 | <22 | <22 | <22UJ | <22 | <220UJ | <45 | <22 | <22 |
| A6F080118-018 | FMSEDNS46+20 (0.5-1.5) | NS46 +20 (0.5-1.5') | 6/7/96 | <8.0 | <8.0 | <8.0UJ | <8.0 | <80UJ | <16 | <8.0 | <8.0 |
| A6F130119-008 | FMSEDNS46+40 (0-0.5) | NS46 +40 (0-0.5') | 6/11/96 | <17 | <17 | <17UJ | <17 | <170UJ | <34 | <17 | <17 |
| A6F080118-017 | FMSEDNS46+40 (0.5-1.5) | NS46 +40 (0.5-1.5') | 6/7/96 | <6.8 | <6.8 | <6.8UJ | <6.8 | <68UJ | <14 | <6.8 | <6.8 |
| A6F130119-009 | FMSEDNS46+80 (0-0.5) | NS46 +80 (0-0.5') | 6/11/96 | <25 | <25 | <25UJ | <25 | <250UJ | <49 | <25 | <25 |
| A6F080118-016 | FMSEDNS46+80 (0.5-1.5) | NS46 +80 (0.5-1.5') | 6/7/96 | <6.2 | <6.2 | <6.2UJ | <6.2 | <62UJ | <12 | <6.2 | <6.2 |
| A6F080118-024 | FMSWNS102 | Equipment Blank | 6/7/96 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A6F130119-015 | FMSWNS105 | Equipment Blank | 6/11/96 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |
| A6F130119-016 | Trip Blank | Trip Blank | 6/11/96 | <5.0 | <5.0 | <5.0 | <5.0 | <50 | <10 | <5.0 | <5.0 |

Notes:

Samples analyzed by Quanterra, Inc., North Canton, Ohio.

Samples for volatile organics by GC/MS (SW 846 8240B)

Analytical results reported in ug/kg.

J - Estimated value (detected).

UJ - Estimated and not detected, value based on data validation.

Table 4-27. Sediment Analytical Results/Lake George Sampling, Semi-Volatile Organic Compounds, Federated Metals, Hammond, Indiana.

| Laboratory I.D. | Sample I.D. | Sample Location and Sample Depth | Date Sampled | 2-Acetylaminofluorene | Aniline | Anthracene | Benzo (a) anthracene | Benzo (b) fluoranthene | Benzo (k) fluoranthene | Benzo (g,h,i) perylene | Benzo (a) pyrene | Benzyl alcohol | bis(2-Chloroethoxy) methane | bis(2-Chloroethyl) ether | bis(2-Chloro-1-methylethyl) ether | bis(2-Ethylhexyl)phthalate | 4-Bromophenyl phenyl ether | Butyl benzyl phthalate | 4-Chloroaniline |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A6F130119-001 | FMSEDNS43+5 (0-0.5) | NS43 +5 (0-0.5') | 6/11/96 | <32,000 | <16,000 | <16,000 | <16,000 | <16,000 | <16,000 | <16,000 | <16,000 | <16,000UJ | <16,000 | <16,000 | <16,000 | 84000J | <16,000 | <16,000 | <16,000 |
| A6F080118-006 | FMSEDNS43+5 (1-1.5) | NS43 +5 (1-1.5') | 6/6/96 | <1,100 | <570 | <570 | 38J | 66J | <570 | <570 | <570 | <570 | <570 | <570 | <590 | 590J | <570 | <570 | <570 |
| A6F080118-007 | FMSEDNS43+20 (0.5-2) | NS43 +20 (0.5-2') | 6/6/96 | <1,200 | <590 | <590 | <590 | <590 | <590 | <590 | <590 | <590 | <590 | <590 | <590 | 430J | <590 | <590 | <590 |
| A6F080118-008 | FMSEDNS43+40 (0-1) | NS43 +40 (0-1') | 6/6/96 | <490 | <490 | <490 | <490 | 70J | <490 | 53J | <490 | <490 | <490 | <490 | <490 | <490UJ | <490 | <490 | <490 |
| A6F080118-003 | FMSEDNS43+80 (0-1) | NS43 +80 (0-1') | 6/6/96 | <1,500 | <730 | <730 | 150J | 230J | 96J | 81J | 100J | <730 | <730 | <730 | <730 | <730UJ | <730 | <730 | <730 |
| A6F080118-004 | FMSEDNS43+80 (1-1.5) | NS43 +80 (1-1.5') | 6/6/96 | <950 | <470 | <470 | <470 | <470 | <470 | <470 | <470 | <470 | <470 | <470 | <470 | <470UJ | <470 | <470 | <470 |
| A6F130119-010 | FMSEDNS44+5 (0-0.5) | NS44 +5 (0-0.5') | 6/11/96 | <2,400 | <1,200 | <1,200 | 370J | 620J | 180J | 280J | 420J | <1,200UJ | <1,200 | <1,200 | <1,200 | <1,200UJ | <1,200 | <1,200 | <1,200 |
| A6F080118-023 | FMSEDNS44+5 (0.5-1.5) | NS44 +5 (0.5-1.5') | 6/7/96 | <840 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420UJ | <420 | <420 | <420 |
| A6F130119-011 | FMSEDNS44+20 (0-0.5) | NS44 +20 (0-0.5') | 6/11/96 | <1,100 | <570 | <570 | 280J | 390J | 100J | 180J | 280J | <570UJ | <570 | <570 | <570 | <570UJ | <570 | <570 | <570 |
| A6F080118-022 | FMSEDNS44+20 (0.5-1.5) | NS44 +20 (0.5-1.5') | 6/7/96 | <880 | <440 | <440 | 62J | 97J | <440 | 51J | 58J | <440 | <440 | <440 | <440 | 330J | <440 | 350J | <440 |
| A6F130119-012 | FMSEDNS44+40 (0-0.5) | NS44 +40 (0-0.5') | 6/11/96 | <1,500 | <750 | <750 | 390J | 620J | 260J | 220J | 430J | <750UJ | <750 | <750 | <750 | 610J | <750 | <750 | <750 |
| A6F080118-021 | FMSEDNS44+40 (0.5-1.5) | NS44 +40 (0.5-1.5') | 6/7/96 | <880 | <440 | <440 | <440 | <440 | <440 | <440 | <440 | <440 | <440 | <440 | <440 | <440UJ | <440 | <440 | <440 |
| A6F130119-013 | FMSEDNS44+80 (0-0.5) | NS44 +80 (0-0.5') | 6/11/96 | <2,100 | <1,000 | <1,000 | 340J | 450J | 220J | 180J | 380J | <1,000UJ | <1,000 | <1,000 | <1,000 | <1,000UJ | <1,000 | <1,000 | <1,000 |
| A6F080118-020 | FMSEDNS44+80 (0.5-1.5) | NS44 +80 (0.5-1.5') | 6/7/96 | <450 | <450 | <450 | <450 | <450 | <450 | <450 | <450 | <450 | <450 | <450 | <450 | <450UJ | <450 | <450 | <450 |
| A6F130119-002 | FMSEDNS45+5 (0-0.5) | NS45 +5 (0-0.5') | 6/11/96 | <2,600 | <1,300 | <1,300 | 430J | 830J | 270J | 320J | 500J | <1,300 | <1,300 | <1,300 | <1,300 | 1,100J | <1,300 | <1,300 | <1,300 |
| A6F080118-015 | FMSEDNS45+5 (0.5-1.5) | NS45 +5 (0.5-1.5') | 6/7/96 | <1,100 | <540 | <540 | <540 | 140J | <540 | 83J | 59J | <540 | <540 | <540 | <540 | 420J | <540 | <540 | <540 |
| A6F130119-003 | FMSEDNS45+20 (0-0.5) | NS45 +20 (0-0.5') | 6/11/96 | <2,900 | <1,500 | <1,500 | 390J | 750J | 200J | 350J | 460J | <1,500UJ | <1,500 | <1,500 | <1,500 | 1500J | <1,500 | <1,500 | <1,500 |
| A6F080118-013 | FMSEDNS45+20 (0.5-1.5) | NS45 +20 (0.5-1.5') | 6/7/96 | <920 | <460 | <460 | <460 | <460 | <460 | <460 | <460 | <460 | <460 | <460 | <460 | 430J | <460 | <460 | <460 |
| A6F080118-014 | FMSEDNS45+103 (0.5-1.5) | NS45 +20 (0.5-1.5')Dup. | 6/7/96 | <840 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | <420 | 280J | <420 | <420 | <420 |
| A6F130119-004 | FMSEDNS45+40 (0-0.5) | NS45 +40 (0-0.5') | 6/11/96 | <2,900 | <1,400 | <1,400 | 500J | 940J | 200J | 370J | 570J | <1,400 | <1,400 | <1,400 | <1,400 | <1,400UJ | <1,400 | <1,400 | <1,400 |
| A6F080118-012 | FMSEDNS45+40 (0.5-1.5) | NS45 +40 (0.5-1.5') | 6/7/96 | <1,100 | <540 | <540 | <540 | <540 | <540 | <540 | <540 | <540 | <540 | <540 | <540 | 370J | <540 | <540 | <540 |
| A6F130119-005 | FMSEDNS45+80 (0-0.5) MS/MSD | NS45 +80 (0-0.5') | 6/11/96 | <2,900 | <1,400 | <1,400 | 220J | 330J | <1,400 | 240J | 240J | <1,400 | <1,400 | <1,400 | <1,400 | 1,100J | <1,400 | <1,400 | <1,400 |
| A6F080118-011 | FMSEDNS45+80 (0.5-1.5) | NS45 +80 (0.5-1.5') | 6/7/96 | <930 | <470 | <470 | <470 | <470 | <470 | <470 | <470 | <470 | <470 | <470 | <470 | 320J | <470 | <470 | <470 |
| A6F130119-007 | FMSEDNS46+20 (0-0.5) | NS46 +20 (0-0.5') | 6/11/96 | <3,600 | <1,800 | <1,800 | 710J | 1,300J | 440J | 480J | 750J | <1,800 | <1,800 | <1,800 | <1,800 | <1,800UJ | <1,800 | <1,800 | <1,800 |
| A6F130119-014 | FMSEDNS104+20 (0-0.5) | NS46 +20 (0-0.5')Dup. | 6/11/96 | <2,900 | <1,500 | <1,500 | 260J | 500J | 240J | 230J | 340J | <1,500UJ | <1,500 | <1,500 | <1,500 | <1,500UJ | <1,500 | <1,500 | <1,500 |
| A6F130119-006 | FMSEDNS46+5 (0-0.5) | NS46 +5 (0-0.5') | 6/11/96 | <2,900 | <1,400 | <1,400 | 460J | 980J | 360J | 360J | 620J | <1,400 | <1,400 | <1,400 | <1,400 | <1,400UJ | <1,400 | <1,400 | <1,400 |
| A6F080118-019 | FMSEDNS46+5 (0.5-1.5) | NS46 +5 (0.5-1.5') | 6/7/96 | <400 | <400 | <400 | 96J | 240J | 100J | 83J | 160J | <400 | <400 | <400 | <400 | 270J | <400 | <400 | <400 |
| A6F080118-018 | FMSEDNS46+20 (0.5-1.5) | NS46 +20 (0.5-1.5') | 6/7/96 | <1,100 | <530 | <530 | 760 | 1,600 | 530 | 480J | 880 | <530 | <530 | <530 | <530 | <530UJ | <530 | <530 | <530 |
| A6F130119-008 | FMSEDNS46+40 (0-0.5) | NS46 +40 (0-0.5') | 6/11/96 | <2,200 | <1,100 | <1,100 | 410J | 680J | 210J | 280J | 380J | <1,100UJ | <1,100 | <1,100 | <1,100 | <1,100UJ | <1,100 | <1,100 | <1,100 |
| A6F080118-017 | FMSEDNS46+40 (0.5-1.5) | NS46 +40 (0.5-1.5') | 6/7/96 | <450 | <450 | <450 | 48J | 77J | <450 | 53J | 50J | <450 | <450 | <450 | <450 | 270J | <450 | <450 | <450 |
| A6F130119-009 | FMSEDNS46+80 (0-0.5) | NS46 +80 (0-0.5') | 6/11/96 | <3,300 | <1,600 | <1,600 | 360J | 600J | 200J | 290J | 420J | <1,600UJ | <1,600 | <1,600 | <1,600 | <1,600UJ | <1,600 | <1,600 | <1,600 |
| A6F080118-016 | FMSEDNS46+80 (0.5-1.5) | NS46 +80 (0.5-1.5') | 6/7/96 | <820 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410 | <410UJ | <410 | <410 | <410 |
| A6F080118-024 | FMSWNS102 | Equipment Blank | 6/7/96 | <20 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | 8.2J | <10 | <10 | <10 |
| A6F130119-015 | FMSWNS105 | Equipment Blank (original) | 6/11/96 | <20 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | 8.2J | <10 | <10 | <10 |
| A6F130119-015 | FMSWNS105 | Equipment Blank (reanalysis) | 6/11/96 | <20 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |

Notes:

Samples analyzed by Quanterra, Inc., North Canton, Ohio.

Samples for semi-volatile organics by GC/MS (SW 846 8270B)

Analytical results reported in ug/L.

Surrogates added to Sample FMSEDNS43+5(0-0.5) were diluted out and could not be quantitated due to high te concentration in the sample. te concent

Sample FMSWNS105 (original) exhibited surrogate recoveries outside acceptance criteria.

Upon reextraction of Sample FMSWNS44+40(reanalysis), surrogate recoveries were within laboratory accepta criteria, however, sample holding times had been exceeded. criteria, ho

Bis(2-ethylhexyl) phthalate was detected in the GC/MS Semi-Volatiles Method Blank (laboratory contaminant).

J - Estimated value (detected).

UJ - Estimated and not detected, value based on data validation.

NA - Not analyzed.

ND* - No reporting limit specified.

Table 4-27. Sediment Analytical Results/Lake George Sampling, Semi-Volatile Organic Compounds, Federated Metals, Hammond, Indiana.

| Laboratory I.D. | Sample I.D. | Sample Location and Sample Depth | Date Sampled | 2,4-Dimethylphenol | Dimethyl phthalate | Di-n-octyl phthalate | 1,3-Dinitrobenzene | 4,6-Dinitro-2-methylphenol | 2,4-Dinitrophenol | 2,4-Dinitrotoluene | 2,6-Dinitrotoluene | 2-sec-Butyl-4,6-dinitrophenol | Diphenylamine | Disulfoton | Ethyl methanesulfonate | Famphur | Fluoranthene | Fluorene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A6F130119-001 | FMSEDNS43+5 (0-0.5) | NS43 +5 (0-0.5') | 6/11/96 | <16,000 | <16,000 | <16,000 | <32,000 | <77,000 | <77,000 | <16,000 | <16,000 | <32,000 | <16,000 | <77,000 | <16,000 | <160,000UJ | <16,000 | <16,000 |
| A6F080118-006 | FMSEDNS43+5 (1-1.5) | NS43 +5 (1-1.5') | 6/6/96 | <570 | <570 | <570 | <1,100 | <2,800 | <2,800 | <570 | <570 | <1,100 | <570 | <2,800 | <570 | <5,700UJ | **73J** | <570 |
| A6F080118-007 | FMSEDNS43+20 (0.5-2) | NS43 +20 (0.5-2') | 6/6/96 | <590 | <590 | <590 | <1,200 | <2,900 | <2,900 | <590 | <590 | <1,200 | <590 | <2,900 | <590 | <5,900UJ | **68J** | <590 |
| A6F080118-008 | FMSEDNS43+40 (0-1) | NS43 +40 (0-1') | 6/6/96 | <490 | <490 | <490 | <970 | <2,400 | <2,400 | <490 | <490 | <970 | <490 | <2,400 | <490 | <4,900UJ | **110J** | <490 |
| A6F080118-003 | FMSEDNS43+80 (0-1) | NS43 +80 (0-1') | 6/6/96 | <730 | <730 | <730 | <1,500 | <3,500 | <3,500 | <730 | <730 | <1,500 | <730 | <3,500 | <730 | <7,300UJ | **650J** | <730 |
| A6F080118-004 | FMSEDNS43+80 (1-1.5) | NS43 +80 (1-1.5') | 6/6/96 | <470 | <470 | <470 | <950 | <2,300 | <2,300 | <470 | <470 | <950 | <470 | <2,300 | <470 | <4,700UJ | **64J** | <470 |
| A6F130119-010 | FMSEDNS44+5 (0-0.5) | NS44 +5 (0-0.5') | 6/11/96 | <1,200 | <1,200 | <1,200 | <2,400 | <5,800 | <5,800 | <1,200 | <1,200 | <2,400 | <1,200 | <5,800 | <1,200 | <12000UJ | **810J** | <1,200 |
| A6F080118-023 | FMSEDNS44+5 (0.5-1.5) | NS44 +5 (0.5-1.5') | 6/7/96 | <420 | <420 | <420 | <840 | <2,000 | <2,000 | <420 | <420 | <840 | <420 | <2,000 | <420 | <4,200UJ | <420 | <420 |
| A6F130119-011 | FMSEDNS44+20 (0-0.5) | NS44 +20 (0-0.5') | 6/11/96 | <570 | <570 | <570 | <1,100 | <2,700 | <2,700 | <570 | <570 | <1,100 | <570 | <2,700 | <570 | <5,700UJ | **480J** | <570 |
| A6F080118-022 | FMSEDNS44+20 (0.5-1.5) | NS44 +20 (0.5-1.5') | 6/7/96 | <440 | <440 | <440 | <880 | <2,100 | <2,100 | <440 | <440 | <880 | <440 | <2,100 | <440 | <4,400UJ | **110J** | <440 |
| A6F130119-012 | FMSEDNS44+40 (0-0.5) | NS44 +40 (0-0.5') | 6/11/96 | <750 | <750 | <750 | <1,500 | <3,600 | <3,600 | <750 | <750 | <1,500 | <750 | <3,600 | <750 | <7,500UJ | **570J** | <750 |
| A6F080118-021 | FMSEDNS44+40 (0.5-1.5) | NS44 +40 (0.5-1.5') | 6/7/96 | <440 | <440 | <440 | <880 | <2,100 | <2,100 | <440 | <440 | <880 | <440 | <2,100 | <440 | <4,400UJ | <440 | <440 |
| A6F130119-013 | FMSEDNS44+80 (0-0.5) | NS44 +80 (0-0.5') | 6/11/96 | <1,000 | <1,000 | <1,000 | <2,100 | <5,000 | <5,000 | <1,000 | <1,000 | <2,100 | <1,000 | <5,000 | <1,000 | <10,000UJ | **800J** | <1,000 |
| A6F080118-020 | FMSEDNS44+80 (0.5-1.5) | NS44 +80 (0.5-1.5') | 6/7/96 | <450 | <450 | <450 | <890 | <2,200 | <2,200 | <450 | <450 | <890 | <450 | <2,200 | <450 | <4,500UJ | <450 | <450 |
| A6F130119-002 | FMSEDNS45+5 (0-0.5) | NS45 +5 (0-0.5') | 6/11/96 | <1,300 | <1,300 | <1,300 | <2,600 | <6,300 | <6,300 | <1,300 | <1,300 | <2,600 | <1,300 | <6,300 | <1,300 | <13,000UJ | **990J** | <1,300 |
| A6F080118-015 | FMSEDNS45+5 (0.5-1.5) | NS45 +5 (0.5-1.5') | 6/7/96 | <540 | <540 | <540 | <1,100 | <2,600 | <2,600 | <540 | <540 | <1,100 | <540 | <2,600 | <540 | <5,400UJ | **140J** | <540 |
| A6F130119-003 | FMSEDNS45+20 (0-0.5) | NS45 +20 (0-0.5') | 6/11/96 | <1,500 | <1,500 | <1,500 | <2,900 | <7,100 | <7,100 | <1,500 | <1,500 | <2,900 | <1,500 | <7,100 | <1,500 | <15,000UJ | **800J** | <1,500 |
| A6F080118-013 | FMSEDNS45+20 (0.5-1.5) | NS45 +20 (0.5-1.5') | 6/7/96 | <460 | <460 | <460 | <920 | <2,200 | <2,200 | <460 | <460 | <920 | <460 | <2,200 | <460 | <4,600UJ | <460 | <460 |
| A6F080118-014 | FMSEDNS45+103 (0.5-1.5) | NS45 +20 (0.5-1.5')Dup. | 6/7/96 | <420 | <420 | <420 | <840 | <2,000 | <2,000 | <420 | <420 | <840 | <420 | <2,000 | <420 | <4,200UJ | <420 | <420 |
| A6F130119-004 | FMSEDNS45+40 (0-0.5) | NS45 +40 (0-0.5') | 6/11/96 | <1,400 | <1,400 | <1,400 | <2,900 | <6,900 | <6,900 | <1,400 | <1,400 | <2,900 | <1,400 | <6,900 | <1,400 | <14,000UJ | **790J** | <1,400 |
| A6F080118-012 | FMSEDNS45+40 (0.5-1.5) | NS45 +40 (0.5-1.5') | 6/7/96 | <540 | <540 | <540 | <1,100 | <2,600 | <2,600 | <540 | <540 | <1,100 | <540 | <2,600 | <540 | <5,400UJ | **69J** | <540 |
| A6F130119-005 | FMSEDNS45+80 (0-0.5) MS/MSD | NS45 +80 (0-0.5') | 6/11/96 | <1,400 | <1,400 | <1,400 | <2,900 | <6,900 | <6,900 | <1,400 | <1,400 | <2,900 | <1,400 | <6,900 | <1,400 | <14,000UJ | **370J** | <1,400 |
| A6F080118-011 | FMSEDNS45+80 (0.5-1.5) | NS45 +80 (0.5-1.5') | 6/7/96 | <470 | <470 | <470 | <930 | <2,300 | <2,300 | <470 | <470 | <930 | <470 | <2,300 | <470 | <4,700UJ | <470 | <470 |
| A6F130119-007 | FMSEDNS46+20 (0-0.5) | NS46 +20 (0-0.5') | 6/11/96 | <1,800 | <1,800 | <1,800 | <3,600 | <8,700 | <8,700 | <1,800 | <1,800 | <3,600 | <1,800 | <8,700 | <1,800 | <18,000UJ | **1,100J** | <1,800 |
| A6F130119-014 | FMSEDNS104+20 (0-0.5) | NS46 +20 (0-0.5')Dup. | 6/11/96 | <1,500 | <1,500 | <1,500 | <2,900 | <7,100 | <7,100 | <1,500 | <1,500 | <2,900 | <1,500 | <7,100 | <1,500 | <15,000UJ | **430J** | <1,500 |
| A6F130119-006 | FMSEDNS46+5 (0-0.5) | NS46 +5 (0-0.5') | 6/11/96 | <1,400 | <1,400 | <1,400 | <2,900 | <6,900 | <6,900 | <1,400 | <1,400 | <2,900 | <1,400 | <6,900 | <1,400 | <14,000UJ | **800J** | <1,400 |
| A6F080118-019 | FMSEDNS46+5 (0.5-1.5) | NS46 +5 (0.5-1.5') | 6/7/96 | <400 | <400 | <400 | <800 | <2,000 | <2,000 | <400 | <400 | <800 | <400 | <2,000 | <400 | <4,000UJ | **99J** | <400 |
| A6F080118-018 | FMSEDNS46+20 (0.5-1.5) | NS46 +20 (0.5-1.5') | 6/7/96 | <530 | <530 | <530 | <1,100 | <2,600 | <2,600 | <530 | <530 | <1,100 | <530 | <2,600 | <530 | <5,300UJ | **380J** | <530 |
| A6F130119-008 | FMSEDNS46+40 (0-0.5) | NS46 +40 (0-0.5') | 6/11/96 | <1,100 | <1,100 | <1,100 | <2,200 | <5,400 | <5,400 | <1,100 | <1,100 | <2,200 | <1,100 | <5,400 | <1,100 | <11,000UJ | **680J** | <1,100 |
| A6F080118-017 | FMSEDNS46+40 (0.5-1.5) | NS46 +40 (0.5-1.5') | 6/7/96 | <450 | <450 | <450 | <890 | <2,200 | <2,200 | <450 | <450 | <890 | <450 | <2,200 | <450 | <4,500UJ | **73J** | <450 |
| A6F130119-009 | FMSEDNS46+80 (0-0.5) | NS46 +80 (0-0.5') | 6/11/96 | <1,600 | <1,600 | <1,600 | <3,300 | <7,900 | <7,900 | <1,600 | <1,600 | <3,300 | <1,600 | <7,900 | <1,600 | <16,000UJ | **720J** | <1,600 |
| A6F080118-016 | FMSEDNS46+80 (0.5-1.5) | NS46 +80 (0.5-1.5') | 6/7/96 | <410 | <410 | <410 | <820 | <2,000 | <2,000 | <410 | <410 | <820 | <410 | <2,000 | <410 | <4,100UJ | <410 | <410 |
| A6F080118-024 | FMSWNS102 | Equipment Blank | 6/7/96 | <10 | <10 | <10 | <10 | <50 | <50 | <10 | <10 | <20 | <10 | NA | <10 | NA | <10 | <10 |
| A6F130119-015 | FMSWNS105 | Equipment Blank (original) | 6/11/96 | <10 | <10 | <10 | <10 | <50 | <50 | <10 | <10 | <20 | <10 | NA | <10 | NA | <10 | <10 |
| A6F130119-015 | FMSWNS105 | Equipment Blank (reanalysis) | 6/11/96 | <10 | <10 | <10 | <10 | <50 | <50 | <10 | <10 | <20 | <10 | NA | <10 | NA | <10 | <10 |

Notes:

Samples analyzed by Quanterra, Inc., North Canton, Ohio.

Samples for semi-volatile organics by GC/MS (SW 846 8270B)

Analytical results reported in ug/L.

Surrogates added to Sample FMSEDNS43+5(0-0.5) were diluted out and could not be quantitated due to high ample. te concentration in the

Sample FMSWNS105 (original) exhibited surrogate recoveries outside acceptance criteria.

Upon reextraction of Sample FMSWNS44+40(reanalysis), surrogate recoveries were within laboratory accepta e holding times had been exceeded. criteria, however, sam

Bis(2-ethylhexyl) phthalate was detected in the GC/MS Semi-Volatiles Method Blank (laboratory contaminant).

J - Estimated value (detected).

UJ - Estimated and not detected, value based on data validation.

NA - Not analyzed.

ND* - No reporting limit specified.

Table 4-27. Sediment Analytical Results/Lake George Sampling, Semi-Volatile Organic Compounds, Federated Metals, Hammond, Indiana.

| Laboratory I.D. | Sample I.D. | Sample Location and Sample Depth | Date Sampled | p-creosol | Naphthalene | 1,4-Naphthoquinone | 1-Naphthylamine | 2-Naphthylamine | 2-Nitroaniline | 3-Nitroaniline | 4-Nitroaniline | Nitrobenzene | 2-Nitrophenol | 4-Nitrophenol | 4-Nitroquinoline-1-oxide | N-Nitrosodi-n-butylamine | N-Nitrosodiethylamine | N-Nitrosodimethylamine |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A6F130119-001 | FMSEDNS43+5 (0-0.5) | NS43 +5 (0-0.5') | 6/11/96 | <16,000 | <16,000 | <32,000 | <16,000 | <16,000 | <77,000 | <77,000 | <77,000 | <16,000 | <16,000 | <77,000 | <160,000 | <16,000 | <16,000 | <16,000 |
| A6F080118-006 | FMSEDNS43+5 (1-1.5) | NS43 +5 (1-1.5') | 6/6/96 | <570 | <570 | <1,100 | <570 | <570 | <2,800 | <2,800 | <2,800 | <570 | <570 | <2,800 | <5,700 | <570 | <570 | <570 |
| A6F080118-007 | FMSEDNS43+20 (0.5-2) | NS43 +20 (0.5-2') | 6/6/96 | <590 | <590 | <1,200 | <590 | <590 | <2,900 | <2,900 | <2,900 | <590 | <590 | <2,900 | <5,900 | <590 | <590 | <590 |
| A6F080118-008 | FMSEDNS43+40 (0-1) | NS43 +40 (0-1') | 6/6/96 | <490 | <490 | <970 | <490 | <490 | <2,400 | <2,400 | <2,400 | <490 | <490 | <2,400 | <4,900 | <490 | <490 | <490 |
| A6F080118-003 | FMSEDNS43+80 (0-1) | NS43 +80 (0-1') | 6/6/96 | <730 | <730 | <1,500 | <730 | <730 | <3,500 | <3,500 | <3,500 | <730 | <730 | <3,500 | <7,300 | <730 | <730 | <730 |
| A6F080118-004 | FMSEDNS43+80 (1-1.5) | NS43 +80 (1-1.5') | 6/6/96 | <470 | <470 | <950 | <470 | <470 | <2,300 | <2,300 | <2,300 | <470 | <470 | <2,300 | <4,700 | <470 | <470 | <470 |
| A6F130119-010 | FMSEDNS44+5 (0-0.5) | NS44 +5 (0-0.5') | 6/11/96 | <1,200 | <1,200 | <2,400 | <1,200 | <1,200 | <5,800 | <5,800 | <5,800 | <1,200 | <1,200 | <5,800 | <12,000 | <1,200 | <1,200 | <1,200 |
| A6F080118-023 | FMSEDNS44+5 (0.5-1.5) | NS44 +5 (0.5-1.5') | 6/7/96 | <420 | <420 | <840 | <420 | <420 | <2,000 | <2,000 | <2,000 | <420 | <420 | <2,000 | <4,200 | <420 | <420 | <420 |
| A6F130119-011 | FMSEDNS44+20 (0-0.5) | NS44 +20 (0-0.5') | 6/11/96 | <570 | <570 | <1,100 | <570 | <570 | <2,700 | <2,700 | <2,700 | <570 | <570 | <2,700 | <5,700 | <570 | <570 | <570 |
| A6F080118-022 | FMSEDNS44+20 (0.5-1.5) | NS44 +20 (0.5-1.5') | 6/7/96 | <440 | <440 | <880 | <440 | <440 | <2,100 | <2,100 | <2,100 | <440 | <440 | <2,100 | <4,400 | <440 | <440 | <440UJ |
| A6F130119-012 | FMSEDNS44+40 (0-0.5) | NS44 +40 (0-0.5') | 6/11/96 | <750 | <750 | <1,500 | <750 | <750 | <3,600 | <3,600 | <3,600 | <750 | <750 | <3,600 | <7,500 | <750 | <750 | <750 |
| A6F080118-021 | FMSEDNS44+40 (0.5-1.5) | NS44 +40 (0.5-1.5') | 6/7/96 | <440 | <440 | <880 | <440 | <440 | <2,100 | <2,100 | <2,100 | <440 | <440 | <2,100 | <4,400 | <440 | <440 | <440UJ |
| A6F130119-013 | FMSEDNS44+80 (0-0.5) | NS44 +80 (0-0.5') | 6/11/96 | <1,000 | <1,000 | <2,100 | <1,000 | <1,000 | <5,000 | <5,000 | <5,000 | <1,000 | <1,000 | <5,000 | <10,000 | <1,000 | <1,000 | <1,000 |
| A6F080118-020 | FMSEDNS44+80 (0.5-1.5) | NS44 +80 (0.5-1.5') | 6/7/96 | <450 | <450 | <890 | <450 | <450 | <2,200 | <2,200 | <2,200 | <450 | <450 | <2,200 | <4,500 | <450 | <450 | <450 |
| A6F130119-002 | FMSEDNS45+5 (0-0.5) | NS45 +5 (0-0.5') | 6/11/96 | <1,300 | <1,300 | <2,600 | <1,300 | <1,300 | <6,300 | <6,300 | <6,300 | <1,300 | <1,300 | <6,300 | <13,000 | <1,300 | <1,300 | <1,300 |
| A6F080118-015 | FMSEDNS45+5 (0.5-1.5) | NS45 +5 (0.5-1.5') | 6/7/96 | <540 | <540 | <1,100 | <540 | <540 | <2,600 | <2,600 | <2,600 | <540 | <540 | <2,600 | <5,400 | <540 | <540 | <540 |
| A6F130119-003 | FMSEDNS45+20 (0-0.5) | NS45 +20 (0-0.5') | 6/11/96 | <1,500 | <1,500 | <2,900 | <1,500 | <1,500 | <7,100 | <7,100 | <7,100 | <1,500 | <1,500 | <7,100 | <15,000 | <1,500 | <1,500 | <1,500 |
| A6F080118-013 | FMSEDNS45+20 (0.5-1.5) | NS45 +20 (0.5-1.5') | 6/7/96 | <460 | <460 | <920 | <460 | <460 | <2,200 | <2,200 | <2,200 | <460 | <460 | <2,200 | <4,600 | <460 | <460 | <460 |
| A6F080118-014 | FMSEDNS45+103 (0,5-1.5) | NS45 +20 (0.5-1.5')Dup. | 6/7/96 | <420 | <420 | <840 | <420 | <420 | <2,000 | <2,000 | <2,000 | <420 | <420 | <2,000 | <4,200 | <420 | <420 | <420 |
| A6F130119-004 | FMSEDNS45+40 (0-0.5) | NS45 +40 (0-0.5') | 6/11/96 | <1,400 | <1,400 | <2,900 | <1,400 | <1,400 | <6,900 | <6,900 | <6,900 | <1,400 | <1,400 | <6,900 | <14,000 | <1,400 | <1,400 | <1,400 |
| A6F080118-012 | FMSEDNS45+40 (0.5-1.5) | NS45 +40 (0.5-1.5') | 6/7/96 | <540 | <540 | <1,100 | <540 | <540 | <2,600 | <2,600 | <2,600 | <540 | <540 | <2,600 | <5,400 | <540 | <540 | <540 |
| A6F130119-005 | FMSEDNS45+80 (0-0.5) MS/MSD | NS45 +80 (0-0.5') | 6/11/96 | <1,400 | <1,400 | <2,900 | <1,400 | <1,400 | <6,900 | <6,900 | <6,900 | <1,400 | <1,400 | <6,900 | <14,000 | <1,400 | <1,400 | <1,400 |
| A6F080118-011 | FMSEDNS45+80 (0.5-1.5) | NS45 +80 (0.5-1.5') | 6/7/96 | <470 | <470 | <930 | <470 | <470 | <2,300 | <2,300 | <2,300 | <470 | <470 | <2,300 | <4,700 | <470 | <470 | <470 |
| A6F130119-007 | FMSEDNS46+20 (0-0.5) | NS46 +20 (0-0.5') | 6/11/96 | <1,800 | <1,800 | <3,600 | <1,800 | <1,800 | <8,700 | <8,700 | <8,700 | <1,800 | <1,800 | <8,700 | <18,000 | <1,800 | <1,800 | <1,800 |
| A6F130119-014 | FMSEDNS104+20 (0-0.5) | NS46 +20 (0-0.5')Dup. | 6/11/96 | <1,500 | <1,500 | <2,900 | <1,500 | <1,500 | <7,100 | <7,100 | <7,100 | <1,500 | <1,500 | <7,100 | <15,000 | <1,500 | <1,500 | <1,500 |
| A6F130119-006 | FMSEDNS46+5 (0-0.5) | NS46 +5 (0-0.5') | 6/11/96 | <1,400 | 150J | <2,900 | <1,400 | <1,400 | <6,900 | <6,900 | <6,900 | <1,400 | <1,400 | <6,900 | <14,000 | <1,400 | <1,400 | <1,400 |
| A6F080118-019 | FMSEDNS46+5 (0.5-1.5) | NS46 +5 (0.5-1.5') | 6/7/96 | <400 | <400 | <800 | <400 | <400 | <2,000 | <2,000 | <2,000 | <400 | <400 | <2,000 | <4,000 | <400 | <400 | <400 |
| A6F080118-018 | FMSEDNS46+20 (0.5-1.5) | NS46 +20 (0.5-1.5') | 6/7/96 | <530 | <530 | <1,100 | <530 | <530 | <2,600 | <2,600 | <2,600 | <530 | <530 | <2,600 | <5,300 | <530 | <530 | <530 |
| A6F130119-008 | FMSEDNS46+40 (0-0.5) | NS46 +40 (0-0.5') | 6/11/96 | <1,100 | <1,100 | <2,200 | <1,100 | <1,100 | <5,400 | <5,400 | <5,400 | <1,100 | <1,100 | <5,400 | <11,000 | <1,100 | <1,100 | <1,100 |
| A6F080118-017 | FMSEDNS46+40 (0.5-1.5) | NS46 +40 (0.5-1.5') | 6/7/96 | <450 | <450 | <890 | <450 | <450 | <2,200 | <2,200 | <2,200 | <450 | <450 | <2,200 | <4,500 | <450 | <450 | <450 |
| A6F130119-009 | FMSEDNS46+80 (0-0.5) | NS46 +80 (0-0.5') | 6/11/96 | <1,600 | <1,600 | <3,300 | <1,600 | <1,600 | <7,900 | <7,900 | <7,900 | <1,600 | <1,600 | <7,900 | <16,000 | <1,600 | <1,600 | <1,600 |
| A6F080118-016 | FMSEDNS46+80 (0.5-1.5) | NS46 +80 (0.5-1.5') | 6/7/96 | <410 | <410 | <820 | <410 | <410 | <2,000 | <2,000 | <2,000 | <410 | <410 | <2,000 | <4,100 | <410 | <410 | <410 |
| A6F080118-024 | FMSWNS102 | Equipment Blank | 6/7/96 | NA | <10 | <200 | <10 | <10 | <50 | <50 | <50 | <10 | <10 | <50 | <100 | <10 | <10 | <10 |
| A6F130119-015 | FMSWNS105 | Equipment Blank (original) | 6/11/96 | NA | <10 | <200 | <10 | <10 | <50 | <50 | <50 | <10 | <10 | <50 | <100 | <10 | <10 | <10 |
| A6F130119-015 | FMSWNS105 | Equipment Blank (reanalysis) | 6/11/96 | NA | <10 | <200 | <10 | <10 | <50 | <50 | <50 | <10 | <10 | <50 | <100 | <10 | <10 | <10 |

Notes:

Samples analyzed by Quanterra, Inc., North Canton, Ohio.

Samples for semi-volatile organics by GC/MS (SW 846 8270B)

Analytical results reported in ug/L.

Surrogates added to Sample FMSEDNS43+5(0-0.5) were diluted out and could not be quantitated due to high ample. te concentration in the

Sample FMSWNS105 (original) exhibited surrogate recoveries outside acceptance criteria.

Upon reextraction of Sample FMSWNS44+40(reanalysis), surrogate recoveries were within laboratory accepta e holding times had been exceeded. criteria, however, sam

Bis(2-ethylhexyl) phthalate was detected in the GC/MS Semi-Volatiles Method Blank (laboratory contaminant).

J - Estimated value (detected).

UJ - Estimated and not detected, value based on data validation.

NA - Not analyzed.

ND* - No reporting limit specified.

Table 4-27. Sediment Analytical Results/Lake George Sampling, Semi-Volatile Organic Compounds, Federated Metals, Hammond, Indiana.

| Laboratory I.D. | Sample I.D. | Sample Location and Sample Depth | Date Sampled | Pyridine | Safrole | 1,2,4,5-Tetrachlorobenzene | 2,3,4,6-Tetrachlorophenol | 1,2,4-Trichlorobenzene | 2,4,5-Trichlorophenol | 2,4,6-Trichlorophenol | 1,3,5-Trinitrobenzene | Aramite | Tetraethyldithiopyrophosphate | Thionazin |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A6F130119-001 | FMSEDNS43+5 (0-0.5) | NS43 +5 (0-0.5') | 6/11/96 | <16,000 | <16,000 | <16,000 | <77,000 | <16,000 | <16,000 | <16,000 | <77,000 | <32,000 | <77,000 | <16,000 |
| A6F080118-006 | FMSEDNS43+5 (1-1.5) | NS43 +5 (1-1.5') | 6/6/96 | <570 | <570 | <570 | <2,800 | <570 | <570 | <570 | <2,800 | <1,100 | <2,800 | <570 |
| A6F080118-007 | FMSEDNS43+20 (0.5-2) | NS43 +20 (0.5-2') | 6/6/96 | <590 | <590 | <590 | <2,900 | <590 | <590 | <590 | <2,900 | <1,200 | <2,900 | <590 |
| A6F080118-008 | FMSEDNS43+40 (0-1) | NS43 +40 (0-1') | 6/6/96 | <490 | <490 | <490 | <2,400 | <490 | <490 | <490 | <2,400 | <970 | <2,400 | <490 |
| A6F080118-003 | FMSEDNS43+80 (0-1) | NS43 +80 (0-1') | 6/6/96 | <730 | <730 | <730 | <3,500 | <730 | <730 | <730 | <3,500 | <1,500 | <3,500 | <730 |
| A6F080118-004 | FMSEDNS43+80 (1-1.5) | NS43 +80 (1-1.5') | 6/6/96 | <470 | <470 | <470 | <2,300 | <470 | <470 | <470 | <2,300 | <950 | <2,300 | <470 |
| A6F130119-010 | FMSEDNS44+5 (0-0.5) | NS44 +5 (0-0.5') | 6/11/96 | <1,200 | <1,200 | <1,200 | <5,800 | <1,200 | <1,200 | <1,200 | <5,800 | <2,400 | <5,800 | <1,200 |
| A6F080118-023 | FMSEDNS44+5 (0.5-1.5) | NS44 +5 (0.5-1.5') | 6/7/96 | <420 | <420 | <420 | <2,000 | <420 | <420 | <420 | <2,000 | <840 | <2,000 | <420 |
| A6F130119-011 | FMSEDNS44+20 (0-0.5) | NS44 +20 (0-0.5') | 6/11/96 | <570 | <570 | <570 | <2,700 | <570 | <570 | <570 | <2,700 | <1,100 | <2,700 | <570 |
| A6F080118-022 | FMSEDNS44+20 (0.5-1.5) | NS44 +20 (0.5-1.5') | 6/7/96 | <440UJ | <440 | <440 | <2,100 | <440 | <440 | <440 | <2,100 | <880 | <2,100 | <440 |
| A6F130119-012 | FMSEDNS44+40 (0-0.5) | NS44 +40 (0-0.5') | 6/11/96 | <750 | <750 | <750 | <3,600 | <750 | <750 | <750 | <3,600 | <1,500 | <3,600 | <750 |
| A6F080118-021 | FMSEDNS44+40 (0.5-1.5) | NS44 +40 (0.5-1.5') | 6/7/96 | <440UJ | <440 | <440 | <2,100 | <440 | <440 | <440 | <2,100 | <880 | <2,100 | <440 |
| A6F130119-013 | FMSEDNS44+80 (0-0.5) | NS44 +80 (0-0.5') | 6/11/96 | <1,000 | <1,000 | <1,000 | <5,000 | <1,000 | <1,000 | <1,000 | <5,000 | <2,100 | <5,000 | <1,000 |
| A6F080118-020 | FMSEDNS44+80 (0.5-1.5) | NS44 +80 (0.5-1.5') | 6/7/96 | <450 | <450 | <450 | <2,200 | <450 | <450 | <450 | <2,200 | <890 | <2,200 | <450 |
| A6F130119-002 | FMSEDNS45+5 (0-0.5) | NS45 +5 (0-0.5') | 6/11/96 | <1,300 | <1,300 | <1,300 | <6,300 | <1,300 | <1,300 | <1,300 | <6,300 | <2,600 | <6,300 | <1,300 |
| A6F080118-015 | FMSEDNS45+5 (0.5-1.5) | NS45 +5 (0.5-1.5') | 6/7/96 | <540 | <540 | <540 | <2,600 | <540 | <540 | <540 | <2,600 | <1,100 | <2,600 | <540 |
| A6F130119-003 | FMSEDNS45+20 (0-0.5) | NS45 +20 (0-0.5') | 6/11/96 | <1,500 | <1,500 | <1,500 | <7,100 | <1,500 | <1,500 | <1,500 | <7,100 | <2,900 | <7,100 | <1,500 |
| A6F080118-013 | FMSEDNS45+20 (0.5-1.5) | NS45 +20 (0.5-1.5') | 6/7/96 | <460 | <460 | <460 | <2,200 | <460 | <460 | <460 | <2,200 | <920 | <2,200 | <460 |
| A6F080118-014 | FMSEDNS45+103 (0.5-1.5) | NS45 +20 (0.5-1.5')Dup. | 6/7/96 | <420 | <420 | <420 | <2,000 | <420 | <420 | <420 | <2,000 | <840 | <2,000 | <420 |
| A6F130119-004 | FMSEDNS45+40 (0-0.5) | NS45 +40 (0-0.5') | 6/11/96 | <1,400 | <1,400 | <1,400 | <6,900 | <1,400 | <1,400 | <1,400 | <6,900 | <2,900 | <6,900 | <1,400 |
| A6F080118-012 | FMSEDNS45+40 (0.5-1.5) | NS45 +40 (0.5-1.5') | 6/7/96 | <540 | <540 | <540 | <2,600 | <540 | <540 | <540 | <2,600 | <1,100 | <2,600 | <540 |
| A6F130119-005 | FMSEDNS45+80 (0-0.5) MS/MSD | NS45 +80 (0-0.5') | 6/11/96 | <1,400 | <1,400 | <1,400 | <6,900 | <1,400 | <1,400 | <1,400 | <6,900 | <2,900 | <6,900 | <1,400 |
| A6F080118-011 | FMSEDNS45+80 (0.5-1.5) | NS45 +80 (0.5-1.5') | 6/7/96 | <470 | <470 | <470 | <2,300 | <470 | <470 | <470 | <2,300 | <930 | <2,300 | <470 |
| A6F130119-007 | FMSEDNS46+20 (0-0.5) | NS46 +20 (0-0.5') | 6/11/96 | <1,800 | <1,800 | <1,800 | <8,700 | <1,800 | <1,800 | <1,800 | <8,700 | <3,600 | <8,700 | <1,800 |
| A6F130119-014 | FMSEDNS104+20 (0-0.5) | NS46 +20 (0-0.5')Dup. | 6/11/96 | <1,500 | <1,500 | <1,500 | <7,100 | <1,500 | <1,500 | <1,500 | <7,100 | <2,900 | <7,100 | <1,500 |
| A6F130119-006 | FMSEDNS46+5 (0-0.5) | NS46 +5 (0-0.5') | 6/11/96 | <1,400 | <1,400 | <1,400 | <6,900 | <1,400 | <1,400 | <1,400 | <6,900 | <2,900 | <6,900 | <1,400 |
| A6F080118-019 | FMSEDNS46+5 (0.5-1.5) | NS46 +5 (0.5-1.5') | 6/7/96 | <400 | <400 | <400 | <2,000 | <400 | <400 | <400 | <2,000 | <800 | <2,000 | <400 |
| A6F080118-018 | FMSEDNS46+20 (0.5-1.5) | NS46 +20 (0.5-1.5') | 6/7/96 | <530 | <530 | <530 | <2,600 | <530 | <530 | <530 | <2,600 | <1,100 | <2,600 | <530 |
| A6F130119-008 | FMSEDNS46+40 (0-0.5) | NS46 +40 (0-0.5') | 6/11/96 | <1,100 | <1,100 | <1,100 | <5,400 | <1,100 | <1,100 | <1,100 | <5,400 | <2,200 | <5,400 | <1,100 |
| A6F080118-017 | FMSEDNS46+40 (0.5-1.5) | NS46 +40 (0.5-1.5') | 6/7/96 | <450 | <450 | <450 | <2,200 | <450 | <450 | <450 | <2,200 | <890 | <2,200 | <450 |
| A6F130119-009 | FMSEDNS46+80 (0-0.5) | NS46 +80 (0-0.5') | 6/11/96 | <1,600 | <1,600 | <1,600 | <7,900 | <1,600 | <1,600 | <1,600 | <7,900 | <3,300 | <7,900 | <1,600 |
| A6F080118-016 | FMSEDNS46+80 (0.5-1.5) | NS46 +80 (0.5-1.5') | 6/7/96 | <410 | <410 | <410 | <2,000 | <410 | <410 | <410 | <2,000 | <820 | <2,000 | <410 |
| A6F080118-024 | FMSWNS102 | Equipment Blank | 6/7/96 | <10 | <10 | <10 | <50 | <10 | <10 | <10 | <50 | <50 | NA | NA |
| A6F130119-015 | FMSWNS105 | Equipment Blank (original) | 6/11/96 | <10 | <10 | <10 | <50 | <10 | <10 | <10 | <50 | <50 | NA | NA |
| A6F130119-015 | FMSWNS105 | Equipment Blank (reanalysis) | 6/11/96 | <10 | <10 | <10 | <50 | <10 | <10 | <10 | <50 | <50 | NA | NA |

Notes:

Samples analyzed by Quanterra, Inc., North Canton, Ohio.

Samples for semi-volatile organics by GC/MS (SW 846 8270B)

Analytical results reported in ug/L.

Surrogates added to Sample FMSEDNS43+5(0-0.5) were diluted out and could not be quantitated due to high

Sample FMSWNS105 (original) exhibited surrogate recoveries outside acceptance criteria.

Upon reextraction of Sample FMSWNS44+40(reanalysis), surrogate recoveries were within laboratory accepta es had been exceeded.

Bis(2-ethylhexyl) phthalate was detected in the GC/MS Semi-Volatiles Method Blank (laboratory contaminant).

J - Estimated value (detected).

UJ - Estimated and not detected, value based on data validation.

NA - Not analyzed.

ND* - No reporting limit specified.

Table 4-29. Maximum Background Concentrations of Pollutants in Indiana Stream and Lake Sediments, R.K. Raman et al., 1996.

| Parameter | Maximum background (mg/kg) | Parameter | Maximum background (mg/kg) |
|---|---|---|---|
| Aluminum | 9,400 | Silver | <0.5 |
| Antimony | 0.49 | Strontium | 110 |
| Arsenic | 29 | Thallium | <3.8 |
| Beryllium | 0.7 | Zinc | 130 |
| Boron | 8.0 | Phenol | <0.2 |
| Cadmium | 1.0 | Cyanide | <0.1 |
| Chromium | 50 | PCB (Total) | 0.022 |
| Cobalt | 20 | Chlordane | 0.029 |
| Copper | 20 | Dieldrin | 0.033 |
| Iron | 57,000 | DDT (Total) | 0.020 |
| Lead | 150 | BHC (Total) | 0.014 |
| Manganese | 1,700 | Pentachlorophenol | 0.003 |
| Mercury | 0.44 | Heptachlor | 0.002 |
| Nickel | 21 | Aldrin | 0.0007 |
| Nitrogen (TKN) | 1,500 | HCB | <0.001 |
| Phosphorus | 610 | Methoxychlor | <0.001 |
| Selenium | 0.55 | Endrin | <0.001 |

Table 4-31. Lake George Sediment Sampling, Comparison of Metals Analytical Results to Background, Federated Metals, Hammond, Indiana.

TOTAL METALS, FLUORIDE, AND TOTAL CYANIDE SAMPLE DATA

| Laboratory I.D. | Sample I.D. | Sample Location and Sample Depth | Date Sampled | Arsenic | Lead | Selenium | Thallium | Silver | Barium | Beryllium | Cadmium | Cobalt | Chromium | Copper | Nickel | Antimony | Tin | Vanadium | Zinc | Mercury | Fluoride | Total Cyanide |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A6F130119-001 | FMSEDNS43+5 (0-0.5) | NS43 +5 (0-0.5') | 6/11/96 | 13.6J | 3,330 | 2.5J | <1.0 | 1.4 | 52.3 | 0.70 | 19.0 | <5.0 | 33.4 | 2,180 | 29.9 | 100 | 360 | 35.8 | 2,840 | 0.89 | 170J | <0.5 |
| A6F080118-006 | FMSEDNS43+5 (1-1.5) | NS43 +5 (1-1.5') | 6/6/96 | 4.9 | 305J | 0.54J | <1.0 | <1.0 | 9.4 | <0.50 | 3.3 | <5.0 | 6.8 | 236 | 6.7 | <30.0 | <100 | 7.3 | 661J | 0.11 | 46J | <0.25 |
| A6F080118-007 | FMSEDNS43+20 (0.5-2) | NS43 +20 (0.5-2') | 6/6/96 | 5.3 | 195LJ | <0.50 | <1.0 | <1.0 | 10.8LJ | <0.50 | 2.3 | 5.8LJ | 27.1LJ | 131LJ | 15.3LJ | <30.0L | <100 | 7.1LJ | 334LJ | 0.10 | 46J | <0.25 |
| A6F080118-008 | FMSEDNS43+40 (0-1) | NS43 +40 (0-1') | 6/6/96 | 4.2 | 154J | 0.54J | <1.0 | <1.0 | 8.4 | <0.50 | 2.7 | <5.0 | 6.0 | 137 | 6.8 | <30.0 | <100 | 6.3 | 395J | <0.10 | 36J | <0.25 |
| A6F080118-003 | FMSEDNS43+80 (0-1) | NS43 +80 (0-1') | 6/6/96 | 19.9 | 937J | 1.8J | <1.0 | <1.0 | 47.2 | <0.50 | 3.4 | 5.2 | 14.3 | 612 | 17.4 | <30.0 | <100 | 14.4 | 750J | 0.51 | 83J | <0.25 |
| A6F080118-004 | FMSEDNS43+80 (1-1.5) | NS43 +80 (1-1.5') | 6/6/96 | 3.0 | 10.8UJ | <0.50 | <1.0 | <1.0 | 7.0 | <0.50 | <1.0 | <5.0 | 5.1 | 13.2 | <4.0 | <30.0 | <100 | <5.0 | 23.4J | <0.10 | 50J | <0.25 |
| A6F130119-010 | FMSEDNS44+5 (0-0.5) | NS44 +5 (0-0.5') | 6/11/96 | 231J | 13,000 | 19.5J | <1.0 | 5.5 | 61.8 | 1.5 | 154 | 5.4 | 80.6 | 5,890 | 89.3 | 918 | 3,680 | 59.8 | 33,200 | 2.6 | 590J | <0.50 |
| A6F080118-023 | FMSEDNS44+5 (0.5-1.5) | NS44 +5 (0.5-1.5') | 6/7/96 | 36.6 | 1210J | 2.5J | <1.0 | <1.0 | 25.6 | <0.50 | 10.8 | 5.7 | 13.8 | 1,510 | 16 | 77.8J | 361 | 8.1 | 3620J | 0.17 | 160J | <0.25 |
| A6F130119-011 | FMSEDNS44+20 (0-0.5) | NS44 +20 (0-0.5') | 6/11/96 | 62.2J | 2,990 | 7.9J | <1.0 | 2.0 | 38.6 | <0.50 | 32.3 | <5.0 | 38.2 | 2,350 | 43.6 | 255 | 630 | 23.4 | 5,760 | 1.2 | 950J | <0.50 |
| A6F080118-022 | FMSEDNS44+20 (0.5-1.5) | NS44 +20 (0.5-1.5') | 6/7/96 | 35.7 | 787J | 2.2J | <1.0 | <1.0 | 20.9 | <0.50 | 10.7 | <5.0 | 12.9 | 814 | 20.8 | 64.4J | 167 | 9.1 | 2850J | 0.31 | 220J | <0.25 |
| A6F130119-012 | FMSEDNS44+40 (0-0.5) | NS44 +40 (0-0.5') | 6/11/96 | 94.7J | 3,260 | 7.9J | <1.0 | 1.9 | 70.3 | 0.59 | 38.6 | 5.5 | 46.6 | 2,910 | 57.4 | 172 | 629 | 29.9 | 4,490 | 1.1 | 640J | <0.50 |
| A6F080118-021 | FMSEDNS44+40 (0.5-1.5) | NS44 +40 (0.5-1.5') | 6/7/96 | 10.9 | 198J | 1.1J | <1.0 | <1.0 | 13.2 | <0.50 | 3.5 | <5.0 | 7.1 | 212 | 8.7 | <30.0 | <100 | 5.8 | 827J | <0.10 | 220J | <0.25 |
| A6F130119-013 | FMSEDNS44+80 (0-0.5) | NS44 +80 (0-0.5') | 6/11/96 | 76.8J | 3,070 | 8.3J | <2.0 | 2.2 | 144 | 0.87 | 42.6 | 17.0 | 66.8 | 2,490 | 90.1 | 253 | 488 | 55.8 | 6,100 | 1.0 | 250J | 0.5J |
| A6F080118-020 | FMSEDNS44+80 (0.5-1.5) | NS44 +80 (0.5-1.5') | 6/7/96 | 7.0 | 122J | <0.50 | <1.0 | <1.0 | 11.2 | <0.50 | 3.1 | <5.0 | 5.5 | 120 | 7.0 | <30.0 | <100 | 6.3 | 486J | <0.10 | 49J | <0.25 |
| A6F130119-002 | FMSEDNS45+5 (0-0.5) | NS45 +5 (0-0.5') | 6/11/96 | 198J | 16,400 | 25.4J | <1.0 | 9.9 | 148 | 2.6 | 211 | 9.4 | 77.3 | 7,000 | 158 | 674 | 3,910 | 78.4 | 48,000 | 8.8 | 980J | <0.50 |
| A6F080118-015 | FMSEDNS45+5 (0.5-1.5) | NS45 +5 (0.5-1.5') | 6/7/96 | 94.7 | 17400J | 5.2J | <1.0 | 3.0 | 34.4 | 0.57J | 79.8 | <5.0 | 12.6 | 1,870 | 30.3 | 368 | 2,510 | 7.5 | 49100J | 3.3 | 260J | <0.25 |
| A6F130119-003 | FMSEDNS45+20 (0-0.5) | NS45 +20 (0-0.5') | 6/11/96 | 53J | 7,420 | 10.8J | <1.0 | 4.5 | 83.6 | 1.5 | 49.2 | 8.9 | 57.0 | 5,750 | 107 | 223 | 1,630 | 51.6 | 9,950 | 2.4 | 330J | <0.50 |
| A6F080118-013 | FMSEDNS45+20 (0.5-1.5) | NS45 +20 (0.5-1.5') | 6/7/96 | 9.2 | 398J | 0.74J | <1.0 | <1.0 | 14.2 | <0.50 | 5.3 | 11.3 | 22.7 | 445 | 19.7 | <30.0 | 130 | 7.5 | 1770J | <0.10 | 52J | <0.25 |
| A6F080118-014 | FMSEDNS45+103 (0.5-1.5) | NS45 +20 (0.5-1.5') (Duplicate) | 6/7/96 | 10.3 | 216J | 0.63J | <1.0 | <1.0 | 10.3 | <0.50 | 3.9 | 12.3 | 17.4 | 309 | 17.1 | <30.0 | <100 | 5.7 | 1320J | <0.10 | 58J | <0.25 |
| A6F130119-004 | FMSEDNS45+40 (0-0.5) | NS45 +40 (0-0.5') | 6/11/96 | 40.6J | 6,490 | 8.9J | <2.0 | 3.5 | 98.2 | 1.4 | 33.5 | 6.1 | 80.8 | 4,150 | 73.6 | 218 | 1,260 | 75.0 | 3,990 | 1.9 | 300J | <0.50 |
| A6F080118-012 | FMSEDNS45+40 (0.5-1.5) | NS45 +40 (0.5-1.5') | 6/7/96 | 9.8 | 215J | 0.72J | <1.0 | <1.0 | 10.2 | <0.50 | 2.1 | 11.9 | 22.3 | 203 | 15.6 | <30.0 | <100 | 9.5 | 387J | <0.10 | 59J | <0.25 |
| A6F130119-005 | FMSEDNS45+80 (0-0.5) MS/MSD | NS45 +80 (0-0.5') | 6/11/96 | 75.8J | 6,240 | 7.4J | <2.0 | 2.9 | 81.8 | 1.1 | 11.6 | <5.0 | 77.5 | 4,090 | 57.6 | 227 | 931 | 67.4 | 1,410 | 1.8 | 270J | <0.50UJ |
| A6F080118-011 | FMSEDNS45+80 (0.5-1.5) | NS45 +80 (0.5-1.5') | 6/7/96 | 7.2 | 157J | 0.53J | <1.0 | <1.0 | 10.5 | <0.50 | 2.3 | 10.6 | 19.5 | 122 | 12.8 | <30.0 | <100 | 8.5 | 344J | <0.10 | 44J | <0.25 |
| A6F130119-006 | FMSEDNS46+5 (0-0.5) | NS46 +5 (0-0.5') | 6/11/96 | 132J | 15,000 | 21.3J | <1.0 | 11.7 | 102 | 1.9 | 118 | 5.1 | 90.1 | 11,900 | 162 | 596 | 2,670 | 67.1 | 35,200 | 6.5 | 1700J | 0.64J |
| A6F080118-019 | FMSEDNS46+5 (0.5-1.5) | NS46 +5 (0.5-1.5') | 6/7/96 | 8.1 | 494J | 0.78J | <1.0 | <1.0 | 12.1 | <0.50 | 3.2 | 5.8 | 12.1 | 403 | 15.9 | <30.0 | 169 | 8.3 | 867J | 0.27 | 77J | <0.25 |
| A6F130119-007 | FMSEDNS46+20 (0-0.5) | NS46 +20 (0-0.5') | 6/11/96 | 118J | 11,700 | 16.2J | <1.0 | 6.3 | 105 | 1.5 | 69.0 | <5.0 | 96.3 | 8,410 | 104 | 425 | 2,200 | 75.6 | 7,360 | 4.7 | 650J | 0.6J |
| A6F130119-014 | FMSEDNS104+20 (0-0.5) | NS46 +20 (0-0.5') Duplicate | 6/11/96 | 80.6 | 15,700 | 8.3J | <2.0 | 7.8 | 110 | 1.8 | 55.2 | 6.3 | 68.1 | 10,500 | 134 | 449 | 3,220 | 86.2 | 5,840 | 5.3 | 680J | 0.56J |
| A6F080118-018 | FMSEDNS46+20 (0.5-1.5) | NS46 +20 (0.5-1.5') | 6/7/96 | 22.6 | 1160J | 1.5J | <1.0 | <1.0 | 29.3 | <0.50 | 20.8 | 5.3 | 16.2 | 1,630 | 32.8 | 37.0 | 293 | 10.6 | 2320J | 0.35 | 110J | <0.25 |
| A6F130119-008 | FMSEDNS46+40 (0-0.5) | NS46 +40 (0-0.5') | 6/11/96 | 84.1J | 9,050 | 9.2J | <1.0 | 4.5 | 102 | 1.0 | 20.5 | <5.0 | 69.1 | 8,380 | 115 | 246 | 1,910 | 56.1 | 4,880 | 3.5 | 430J | <0.50 |
| A6F080118-017 | FMSEDNS46+40 (0.5-1.5) | NS46 +40 (0.5-1.5') | 6/7/96 | 12.1 | 1820J | 0.74J | <1.0 | <1.0 | 68.8 | <0.50 | 2.2 | 8.0 | 11.2 | 3,110 | 48.1 | 34.5 | 553 | 7.2 | 5050J | 0.56 | 130J | <0.25 |
| A6F130119-009 | FMSEDNS46+80 (0-0.5) | NS46 +80 (0-0.5') | 6/11/96 | 107J | 5,570 | 7.6J | <1.0 | 2.8 | 95.5 | 1.0 | 29.7 | 7.3 | 62.7 | 4,130 | 69.9 | 219 | 905 | 61.8 | 4,800 | 1.2 | 240J | 3J |
| A6F080118-016 | FMSEDNS46+80 (0.5-1.5) | NS46 +80 (0.5-1.5') | 6/7/96 | 6.3 | 29.8 | 0.6J | <1.0 | <1.0 | 7.4 | <0.50 | <1.0 | 13.0 | 31.3 | 23.3 | 16.4 | <30.0 | <100 | 7.0 | 96.1UJ | <0.10 | 55J | <0.25 |
| A6F080118-024 | FMSWNS102 | Equipment Blank | 6/7/96 | <5.0 | <3.0 | <5.0 | <10.0 | <10.0 | <10.0 | <5.0 | <10.0 | <50.0 | <20.0 | <10.0 | <40.0 | <300 | <1,000 | <50.0 | 54.2 | <0.20 | <1,200 | <5.0 |
| A6F130119-015 | FMSWNS105 | Equipment Blank | 6/11/96 | <5.0 | 4.3 | <5.0 | <10.0 | <10.0 | <10.0 | <5.0 | <10.0 | <50.0 | <20.0 | <10.0 | <40.0 | <300 | <1,000 | <50.0 | <50.0 | <0.20 | <1,200 | <5.0 |
| Indiana Stream and Lake Sediment Maximum Background Concentrations | | | | 29 | 150 | 0.55 | <3.8 | <0.5 | NBC | 0.7 | 1.0 | 20 | 50 | 20 | 21 | 0.49 | NBC | NBC | 130 | 0.44 | NBC | <0.1 |
| Illinois Lake Sediment Classification Range | | | | <27 | 15-100 | NC | NC | NC | NC | NC | <1.8 | NC | 14-30 | <100 | NC | NC | NC | NC | 50-175 | <0.25 | NC | NC |

Notes:

Samples analyzed by Quanterra, Inc., North Canton, Ohio.
With exception of mercury, samples for total metals by Trace Inductively Coupled Plasma (ICP) SW846 Method 6010A.
Samples for total mercury by Manual cold-vapor SW846 Method 7470.
Samples for Fluoride analyzed by MCAWW 340.2.
Samples for Cyanide analyzed by SW846 Method 9012.
Soil analytical results reported in mg/kg.
Water analytical results reported in ug/L.
L - Due to a greater than 10% difference between initial and serial dilution results, a chemical or physical interference is suspected.
J - Estimated value (detected).
UJ - Estimated and not detected, value based on data validation.
BOLD - Meets or exceeds maximum Background Concentrations of Pollutants in Indiana Stream and Lake Sediments (R.K. Raman et al, 1996)
UNDERLINED - Exceeds the normal concentration range given in the "Classification of Illinois Lake Sediments" (R.K. Raman et al, 1996) (Kelly and Hite, 1981)
NBC - No background concentration given
NC - No classification range given

Table 5-2. Demographic and Economic Data for Surrounding Towns, Federated Metals, Hammond, Indiana.

| Category | Calumet, IL | East Chicago, IN | Hammond, IN | Whiting, IN |
|---|---|---|---|---|
| Total Population | 37,840 | 33,892 | 84,236 | 5,155 |
| Male | 17,897 | 16,109 | 40,793 | 2,505 |
| Female | 19,943 | 17,783 | 43,443 | 2,650 |
| Percent of population under 18 | 23.2 | 30.9 | 26.8 | 23.7 |
| Percent of population over 65 | 15.5 | 13.2 | 14.3 | 17.1 |
| Number of households | 15,434 | 12,122 | 32,146 | 2,137 |
| Persons per household | 2.45 | 2.78 | 2.61 | 2.41 |
| Per capita income, dollars | 13,569 | 9,090 | 11,576 | 11,664 |

Source: R.K. Raman et al, 1996; 1990 census data (U.S. Bureau of the Census, Economic Census and Surveys Division. 1992)

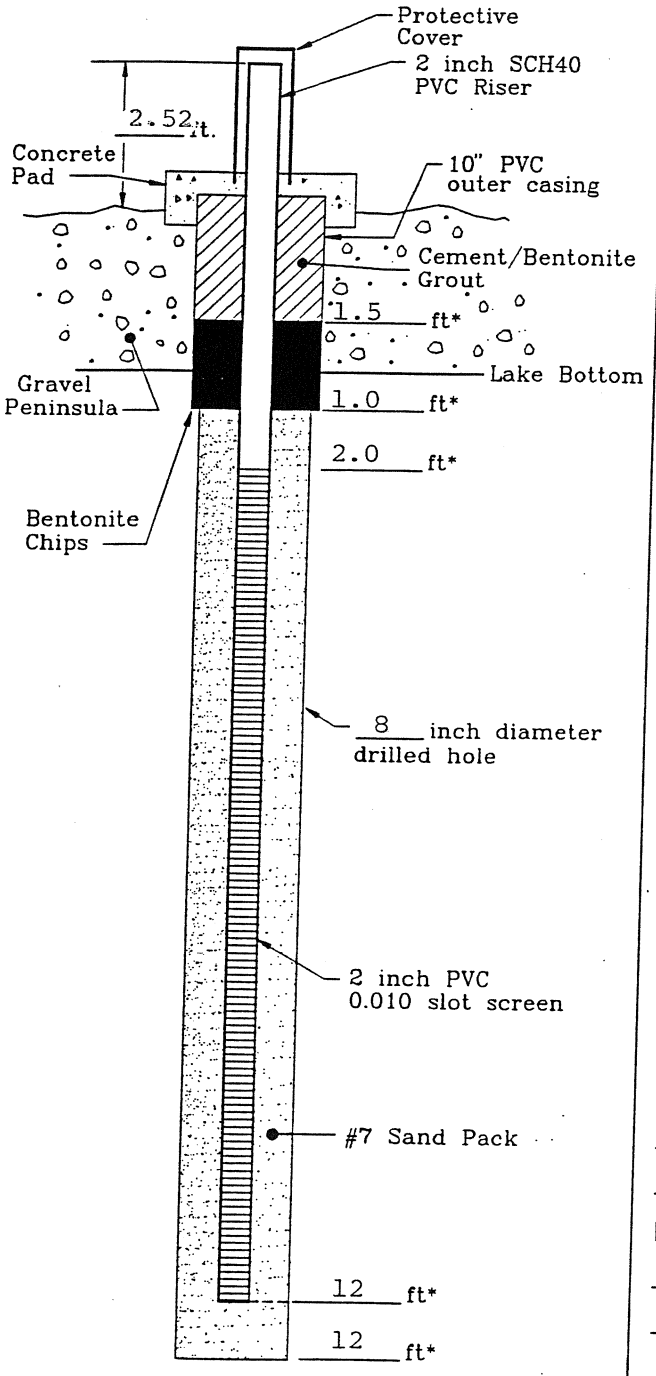
# APPENDIX A

## MONITORING WELL/PIEZOMETER CONSTRUCTION LOGS

RECEIVED
DEC 24 1996
Enforcement & Compliance Assurance Branch
Waste, Pesticides & Toxics Division
U.S. EPA – REGION 5

GERAGHTY & MILLER, INC.
*Environmental Services*

# WELL CONSTRUCTION LOG
(UNCONSOLIDATED)




* Depth Below Lake Bottom

Project Federated Metals Well MW-6S

Town/City Whiting

County Lake State IN

Permit No. N/A

Land-Surface Elevation

and Datum 585.05 feet ☒ Surveyed

TOC Elevation 587.57 ft. ☐ Estimated

Installation Date(s) 06/12/95.

Drilling Method 4¼ HSA

Drilling Contractor Top Flight.

Drilling Fluid None.

Development Technique(s) and Date(s)

Surge block and submersible pump 06/19/95.

Turbidity - 0.86 NTU.

Fluid Loss During Drilling N/A gallor

Water Removed During Development 40 gallor

Static Depth to Water N/A feet below M.P

Pumping Depth to Water N/A feet below M.P

Pumping Duration N/A hours

Yield N/A gpm Date N/A

Specific Capacity N/A gpm/ft

Well Purpose Monitoring well (background).

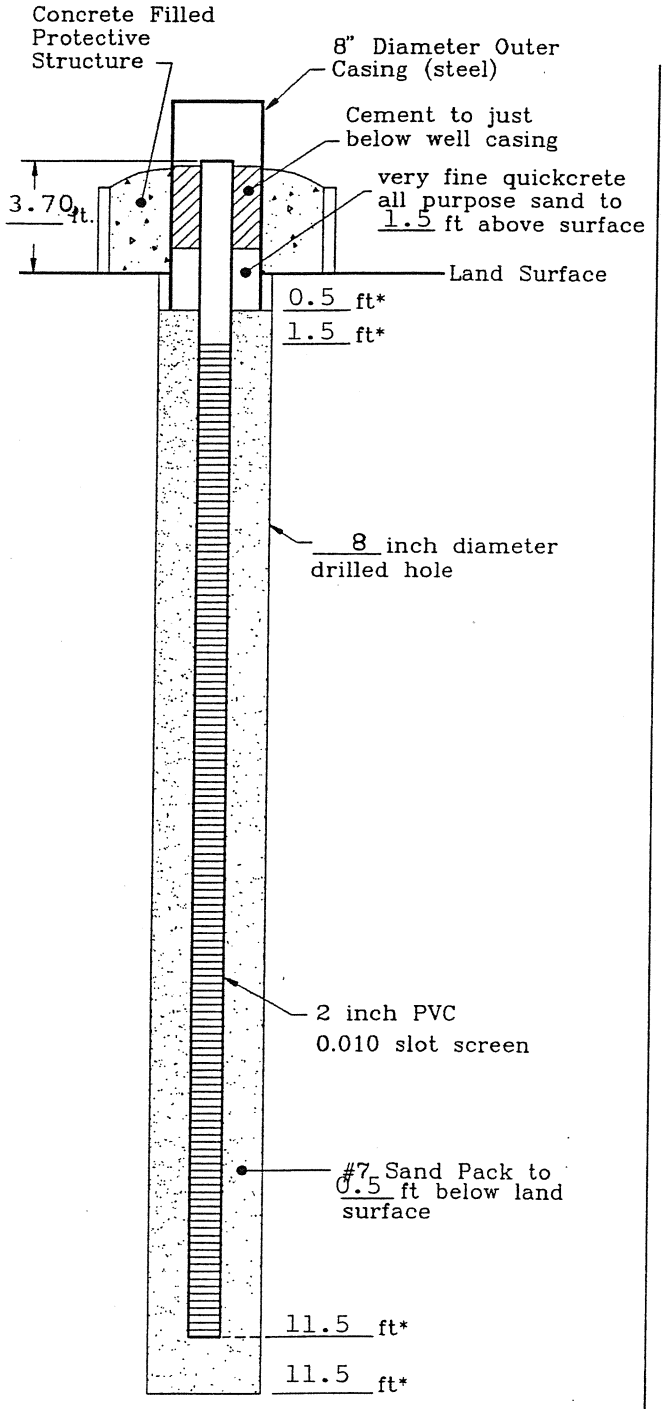
Remarks 10" PVC outer casing was installed with a backhoe excavation to the lake bottom. (Cobbles were too large for the augers.

Prepared by Jamie Yater

N/A- Not Applicable.

GERAGHTY & MILLER, INC.
*Environmental Services*

# WELL CONSTRUCTION LOG
(UNCONSOLIDATED)




* Depth Below Land Surface

Project Federated Metals Well MW-7S

Town/City Whiting

County Lake State IN

Permit No. N/A.

Land-Surface Elevation

and Datum 584.10 feet ☒ Surveyed

TOC Elevation 587.80 ft. ☐ Estimated

Installation Date(s) 06/09/95.

Drilling Method 4¼ HSA

Drilling Contractor Top Flight.

Drilling Fluid None.

Development Technique(s) and Date(s)

Surge Block & Submersible Pump 06/19/95.

Turbidity - 3.78 NTU

Fluid Loss During Drilling N/A gallons

Water Removed During Development 40 gallons

Static Depth to Water N/A feet below M.P

Pumping Depth to Water N/A feet below M.P

Pumping Duration N/A hours

Yield N/A gpm Date N/A

Specific Capacity N/A gpm/ft

Well Purpose Monitoring Calumet Aquifer

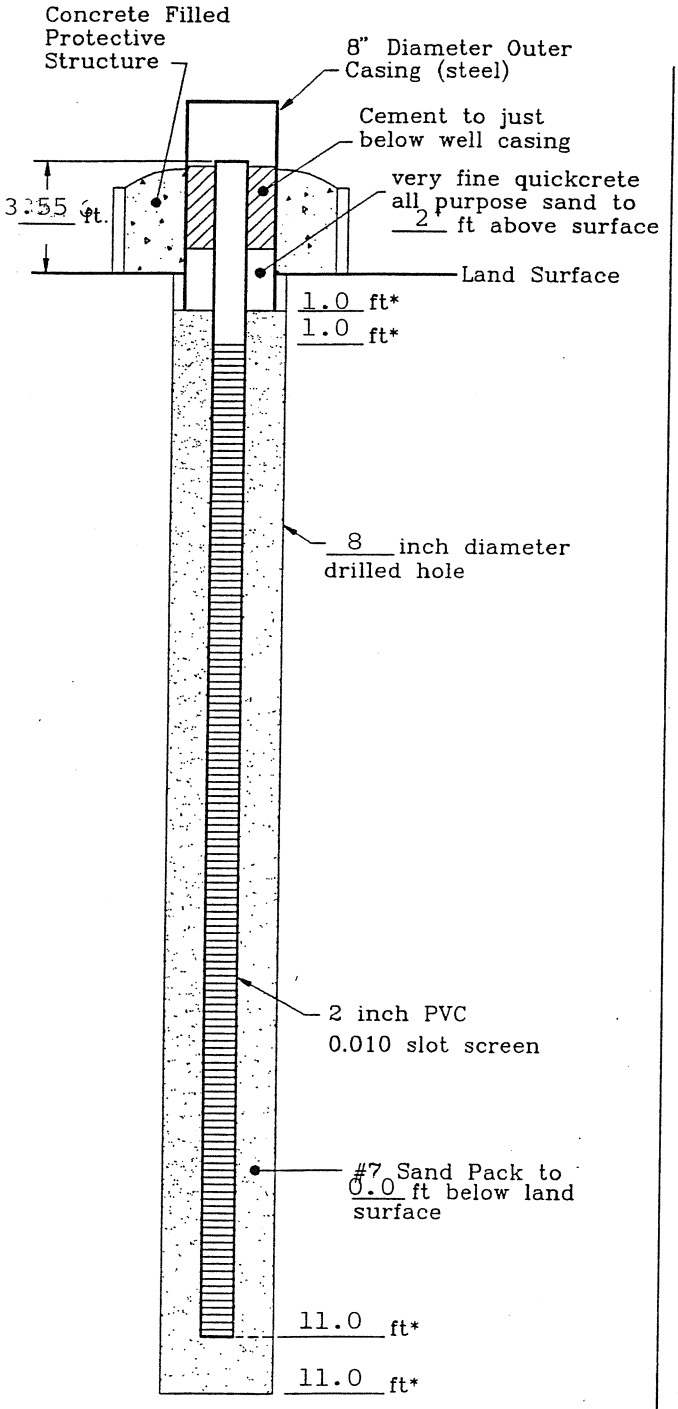
Remarks

Prepared by Jamie Yater

N/A - Not Applicable

GERAGHTY & MILLER, INC.
*Environmental Services*

# WELL CONSTRUCTION LOG
(UNCONSOLIDATED)




* Depth Below Land Surface

Project Federated Metals Well MW-8S

Town/City Whiting

County Lake State IN

Permit No. N/A

Land-Surface Elevation

and Datum 583.66 feet ☒ Surveyed

TOC Elevation 587.21 ft. ☐ Estimated

Installation Date(s) 06/08/95.

Drilling Method 4¼ HSA

Drilling Contractor Top Flight

Drilling Fluid None.

Development Technique(s) and Date(s)

Surge Block & Submersible Pump 06/19/95.
Turbidity - 4.47 NTU.

Fluid Loss During Drilling N/A gallons

Water Removed During Development 50 gallons

Static Depth to Water N/A feet below M.P.

Pumping Depth to Water N/A feet below M.P.

Pumping Duration N/A hours

Yield N/A gpm Date N/A

Specific Capacity N/A gpm/ft

Well Purpose Monitoring Calumet Aquifer

Remarks

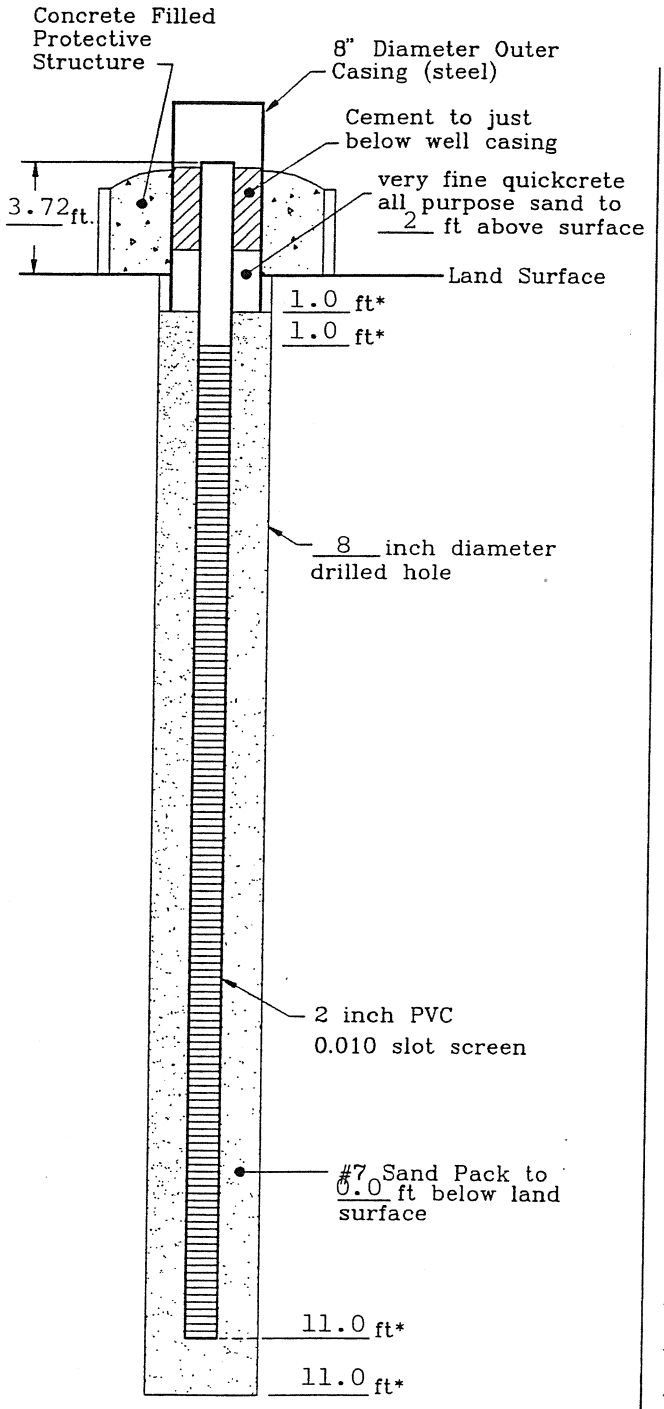
Prepared by Jamie Yater.

N/A- Not Applicable

Southprint 89-0978

GERAGHTY & MILLER, INC.
*Environmental Services*

# WELL CONSTRUCTION LOG
(UNCONSOLIDATED)




* Depth Below Land Surface

Project Federated Metals Well MW-9S

Town/City Whiting

County Lake State IN

Permit No. N/A.

Land-Surface Elevation

and Datum 582.83 feet ☒ Surveyed

TOC Elevation 586.55 ft. ☐ Estimated

Installation Date(s) 06/08/95.

Drilling Method 4¼ HSA

Drilling Contractor Top Flight.

Drilling Fluid None.

Development Technique(s) and Date(s)

Surge Block & Submersible Pump. 06/19/95.

Turbidity - 4.86 NTU.

Fluid Loss During Drilling N/A gallons

Water Removed During Development 45 gallons

Static Depth to Water N/A feet below M.P.

Pumping Depth to Water N/A feet below M.P.

Pumping Duration N/A hours

Yield N/A gpm Date N/A

Specific Capacity _____ gpm/ft

Well Purpose Monitoring Calumet Aquifer

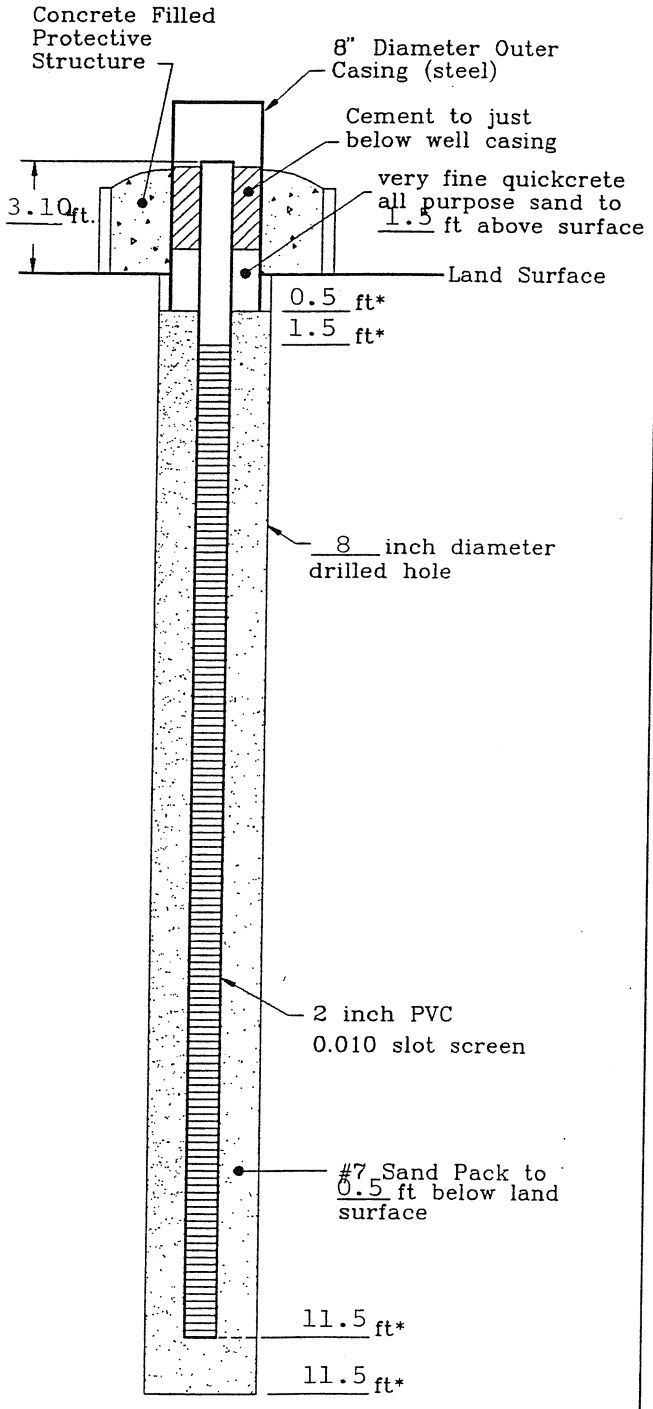
Remarks

Prepared by Jamie Yater

N/A- Not Applicable.

GERAGHTY & MILLER, INC.
*Environmental Services*

# WELL CONSTRUCTION LOG
(UNCONSOLIDATED)




* Depth Below Land Surface

Project Federated Metals Well MW - 10S

Town/City Whiting

County Lake State IN

Permit No. N/A

Land-Surface Elevation

and Datum 583.88 feet ☒ Surveyed

TOC Elevation 586.98 ft. ☐ Estimated

Installation Date(s) 06/09/95.

Drilling Method 4¼ HSA

Drilling Contractor Top Flight.

Drilling Fluid None.

Development Technique(s) and Date(s)

Surge Block & Submersible Pump 06/16/95.

Turbidity - 5.32.

Fluid Loss During Drilling N/A gallons

Water Removed During Development 55 gallons

Static Depth to Water N/A feet below M.P.

Pumping Depth to Water N/A feet below M.P.

Pumping Duration N/A hours

Yield N/A gpm Date N/A

Specific Capacity _____ gpm/ft

Well Purpose Monitoring Calumet Aquifer.

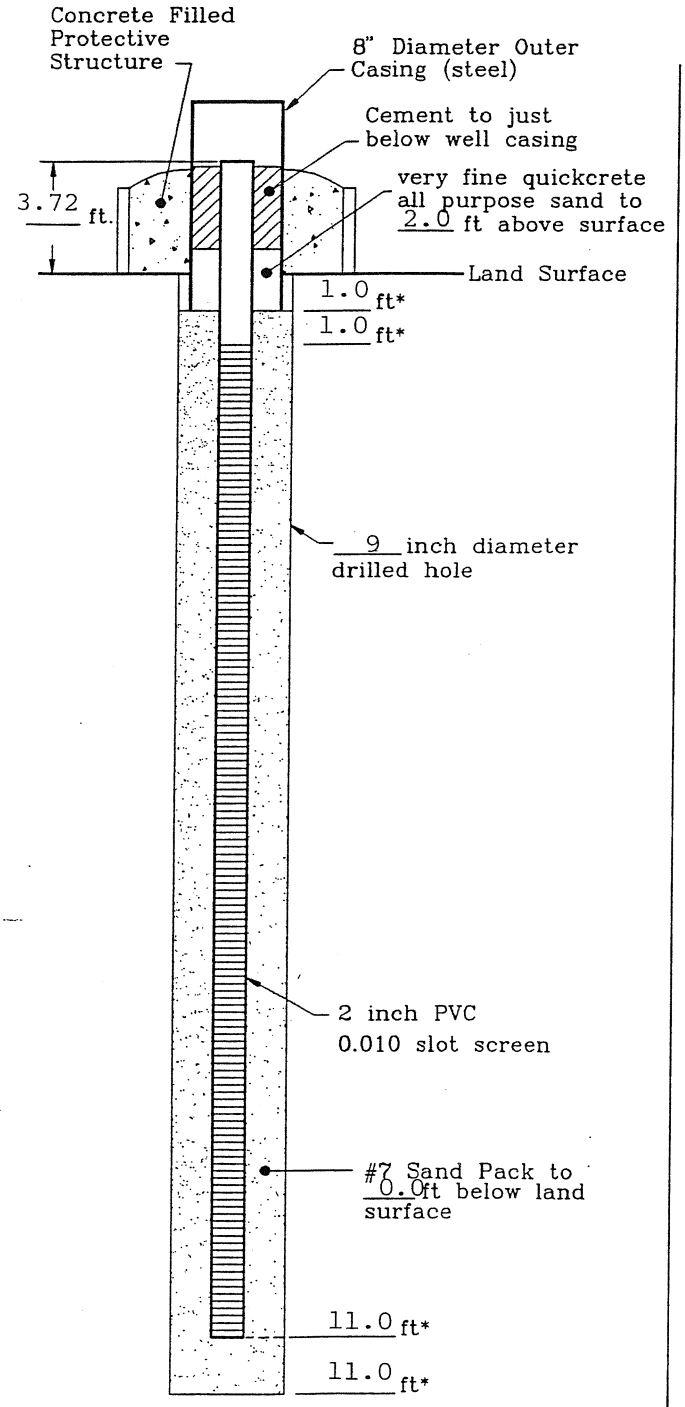
Remarks

NA - Not Applicable.

Prepared by Jamie Yater

GERAGHTY & MILLER, INC.
*Environmental Services*

# WELL CONSTRUCTION LOG
(UNCONSOLIDATED)




* Depth Below Land Surface

Project Federated Metals Well MW-11s

Town/City Whiting

County Lake State Indiana

Permit No. NA

Land-Surface Elevation

and Datum 582.39 feet ☒ Surveyed

TOC Elevation 586.11 feet ☐ Estimated

Installation Date(s) 6/9/95

Drilling Method 4¼ HSA

Drilling Contractor Top Flight

Drilling Fluid None

Development Technique(s) and Date(s)

Surge Block & Submersible Pump

6/19/95

Turbidity - 2.93 NTU

Fluid Loss During Drilling NA gallons

Water Removed During Development 40 gallons

Static Depth to Water NA feet below M.P.

Pumping Depth to Water NA feet below M.P.

Pumping Duration NA hours

Yield NA gpm Date NA

Specific Capacity NA gpm/ft

Well Purpose Monitoring Calumet Aquifer

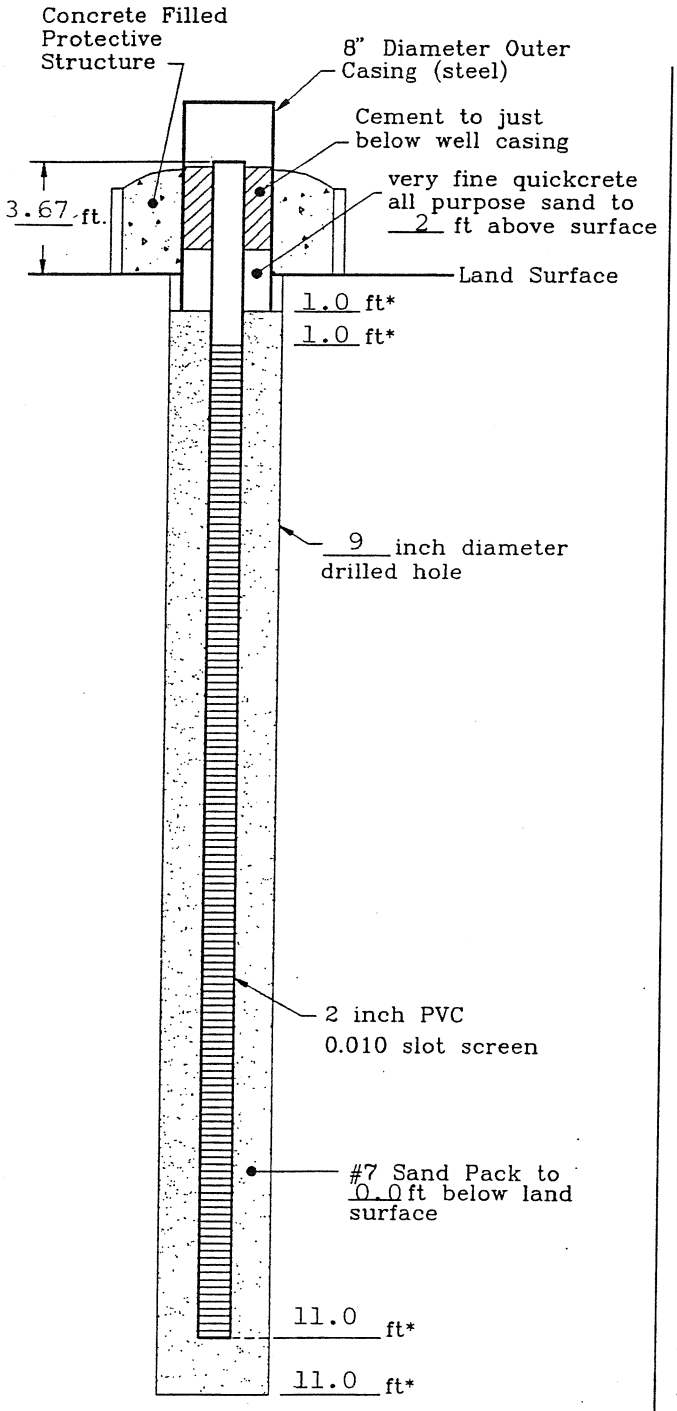
Remarks

Prepared by Jamie Yater

NA - Not Applicable

GERAGHTY & MILLER, INC.
*Environmental Services*

# WELL CONSTRUCTION LOG
(UNCONSOLIDATED)




* Depth Below Land Surface

Project Federated Metals Well MW-12s

Town/City Whiting

County Lake State IN

Permit No. NA

Land-Surface Elevation

and Datum 582.59 feet ☒ Surveyed

TOC Elevation 586.26 feet ☐ Estimated

Installation Date(s) 6/9/95

Drilling Method 4¼ HSA

Drilling Contractor Top Flight

Drilling Fluid Add 15 gallons water due to sand heave.

Development Technique(s) and Date(s)

Surge Block & Submersible Pump

6/16/95

Turbidity - 5.95 NTU

Fluid Loss During Drilling 15 gallons

Water Removed During Development 50 gallons

Static Depth to Water NA feet below M.P.

Pumping Depth to Water NA feet below M.P.

Pumping Duration NA hours

Yield NA gpm Date NA

Specific Capacity N/A gpm/ft

Well Purpose Monitoring Calumet Aquifer

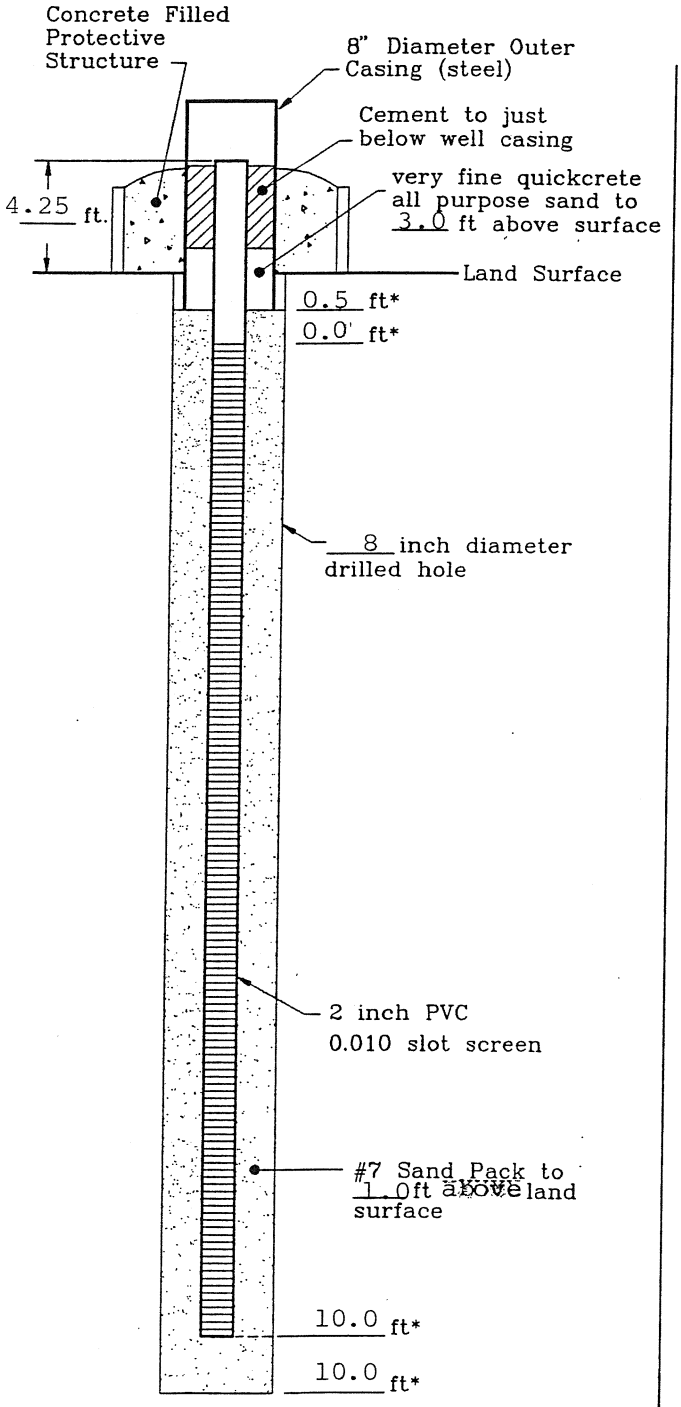
Remarks

Prepared by Jamie Yater

NA - Not applicable

GERAGHTY & MILLER, INC.
*Environmental Services*

# WELL CONSTRUCTION LOG
(UNCONSOLIDATED)




* Depth Below Land Surface

Project Federated Metals Well MW-13S

Town/City Whiting

County Lake State IN

Permit No. NA

Land-Surface Elevation

and Datum 582.58 feet ☒ Surveyed

TOC Elevation 586.83 feet ☐ Estimated

Installation Date(s) 6/8/95

Drilling Method 4¼" HSA

Drilling Contractor Top Flight

Drilling Fluid None

Development Technique(s) and Date(s)

Surge Block & Submersible Pump

6/19/95

Turbidity - 3.64 NTU

Fluid Loss During Drilling NA gallons

Water Removed During Development 40 gallons

Static Depth to Water NA feet below M.P.

Pumping Depth to Water NA feet below M.P.

Pumping Duration NA hours

Yield NA gpm Date NA

Specific Capacity NA gpm/ft

Well Purpose Monitoring Calumet Aquifer

Remarks

Prepared by Jamie Yater

NA - Not applicable

Southprint 89-0978

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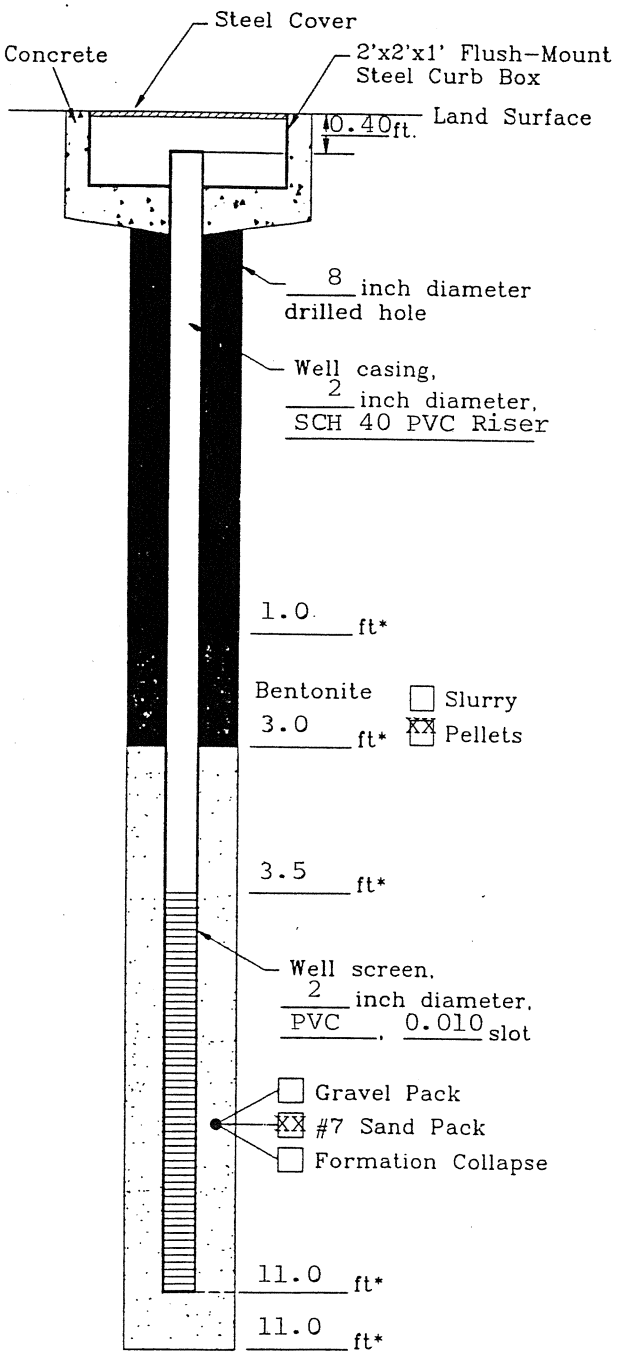
*Environmental Services*

# WELL CONSTRUCTION LOG
(UNCONSOLIDATED)




Project Federated Metals Well MW-14S

Town/City Whiting

County Lake State Indiana

Permit No. N/A

Land-Surface Elevation

and Datum 582.50 feet ☒ Surveyed

TOC Elevation 582.10 ft. ☐ Estimated

Installation Date(s) 11/16/95

Drilling Method 4 1/4 HSA

Drilling Contractor Top Flight

Drilling Fluid None

Development Technique(s) and Date(s)

Surge block and submersible pump, 12/07/95

Turbidity - 3.03

Fluid Loss During Drilling N/A gallons

Water Removed During Development 90 gallons

Static Depth to Water 2.07 feet below M.P.

Pumping Depth to Water N/A feet below M.P.

Pumping Duration N/A hours

Yield N/A gpm Date

Specific Capacity N/A gpm/ft

Well Purpose Monitoring Calumet Aquifer

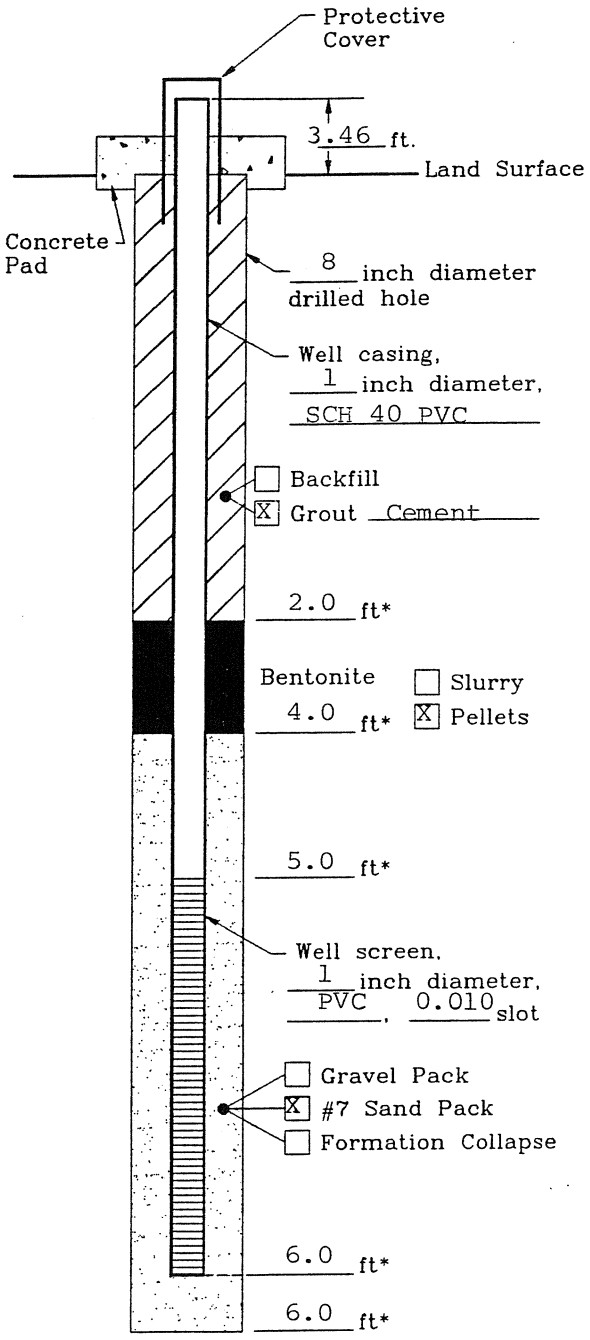
Remarks

Prepared by Jamie Yater

* Depth Below Land Surface

GERAGHTY & MILLER, INC.
*Environmental Services*

# WELL CONSTRUCTION LOG
(UNCONSOLIDATED)




* Depth Below Land Surface

Project Federated Metals Well P-1S

Town/City Whiting

County Lake State Indiana

Permit No. NA

Land-Surface Elevation

and Datum 582.51 feet ☒ Surveyed

TOC Elevation 585.97 feet ☐ Estimated

Installation Date(s) 6/13/95

Drilling Method 4¼" HSA

Drilling Contractor Top Flight

Drilling Fluid None

Development Technique(s) and Date(s)

Surge block and teflon bailer

11/08/95

Fluid Loss During Drilling NA gallons

Water Removed During Development 5.0 gallons

Static Depth to Water NA feet below M.P.

Pumping Depth to Water NA feet below M.P.

Pumping Duration NA hours

Yield NA gpm Date NA

Specific Capacity NA gpm/ft

Well Purpose Groundwater Elevation Measurements

Remarks

Prepared by Jamie Yater

NA - Not applicable

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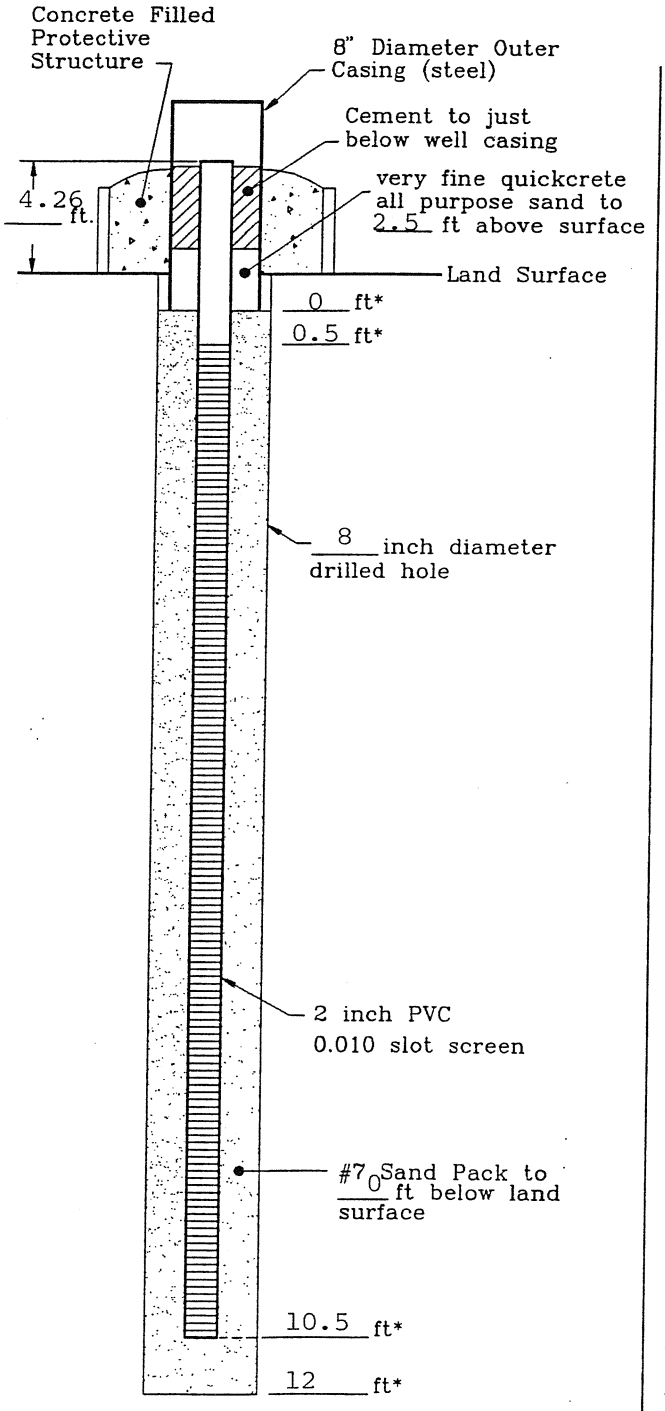
*Environmental Services*

# WELL CONSTRUCTION LOG
(UNCONSOLIDATED)




* Depth Below Land Surface

Project Federated Metals Well MW-15S

Town/City Hammond

County Lake State Indiana

Permit No. N/A

Land-Surface Elevation

and Datum 581.84 feet ☒ Surveyed

TOC Elevation 586.10 ft. ☐ Estimated

Installation Date(s) 5-13-96 and 5-15-96

Drilling Method 4¼ Hollow Stem Augers

Drilling Contractor Top Flight

Drilling Fluid None

Development Technique(s) and Date(s)

5-15-96

Surge & Pump (submersible)

Turbidity - 4.64 NTU

Fluid Loss During Drilling N/A gallons

Water Removed During Development 40 gallons

Static Depth to Water 5.51 feet below M.P

Pumping Depth to Water * feet below M.P

Pumping Duration 0.75 hours

Yield N/A gpm Date N/A

Specific Capacity N/A gpm/ft

Well Purpose Monitoring Calumet Aquifer

Remarks *Pumped at one foot above well bottom

Turbidity=4.64 NTU after removing 40 gallons.

Prepared by Jamie Yater

N/A - Not Applicable

Southprint 89-0978

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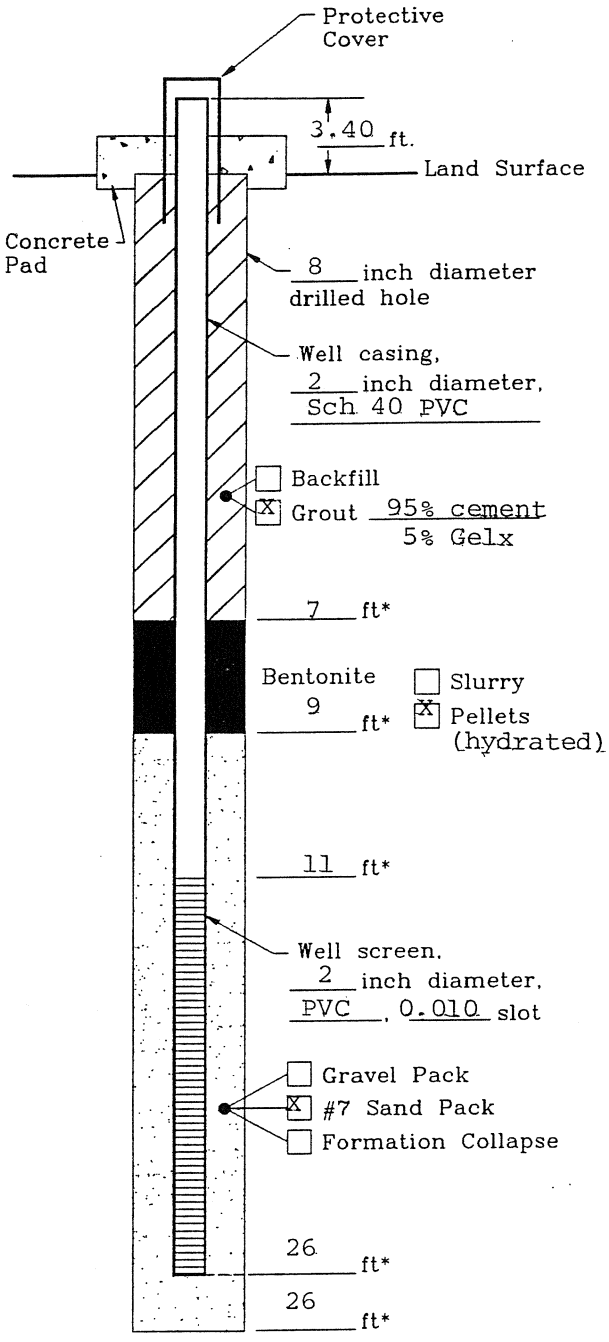
*Environmental Services*

# WELL CONSTRUCTION LOG
(UNCONSOLIDATED)




* Depth Below Land Surface

Project Federated Metals Well MW-16D

Town/City Hammond

County Lake State Indiana

Permit No. N/A

Land-Surface Elevation

and Datum 582.18 feet ☒ Surveyed

TOC Elevation 585.58 ft. ☐ Estimated

Installation Date(s) 5-13-96

Drilling Method 4¼ Hollow Stem Augers

Drilling Contractor Top Flight

Drilling Fluid None

Development Technique(s) and Date(s)

5-15-96 Surge & Pump (submersible)

Turbidity - 4.64 NTU

Fluid Loss During Drilling N/A gallons

Water Removed During Development 210 gallons

Static Depth to Water 5.42 feet below M.P.

Pumping Depth to Water * feet below M.P.

Pumping Duration N/A hours

Yield N/A gpm Date N/A

Specific Capacity N/A gpm/ft

Well Purpose

Monitoring groundwater within the lower 15' of the Calumet Aquifer

Remarks

*Pumped at 2' from bottom of well. After removing 210 gallons turbidity = 4.64 NTU

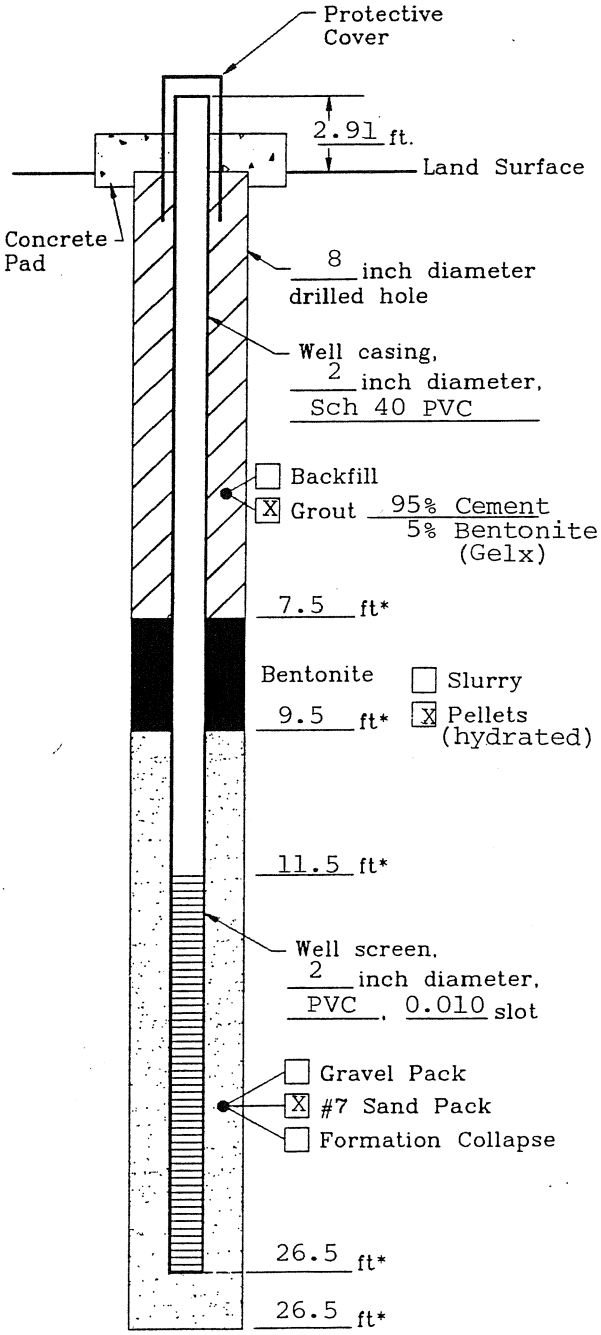
Prepared by Jamie Yater

N/A - Not Applicable

Southprint 89-0978

GERAGHTY & MILLER, INC.
*Environmental Services*

# WELL CONSTRUCTION LOG
(UNCONSOLIDATED)




* Depth Below Land Surface

**Project** Federated Metals **Well** MW-17D

**Town/City** Hammond

**County** Lake **State** Indiana

**Permit No.** N/A

**Land-Surface Elevation**

**and Datum** 582.12 feet ☒ Surveyed

TOC Elevation 585.03 ft. ☐ Estimated

**Installation Date(s)** 5-14-96

**Drilling Method** 4¼ Hollow Stem Augers

**Drilling Contractor** Top Flight

**Drilling Fluid** Added 20 gallons of potable water to prevent heaving sand

**Development Technique(s) and Date(s)**

Surge & Pump (submersible) 5-15-96

Turbidity - 3.98 NTU

**Fluid Loss During Drilling** N/A gallons

**Water Removed During Development** 100 gallons

**Static Depth to Water** 5.05 feet below M.P.

**Pumping Depth to Water** * feet below M.P.

**Pumping Duration** N/A hours

**Yield** N/A gpm **Date** N/A

**Specific Capacity** N/A gpm/ft

**Well Purpose** Monitoring groundwater within the lower 15' of the Calumet Aquifer

**Remarks**

*Pumped at 2' from bottom of well. After removing 100 gallons NTU = 3.98

**Prepared by** Jamie Yater

N/A - Not Applicable

# APPENDIX D

## SOIL BORING LOGS

# SOIL BORING LOG



Well # MW-6D  Project/# Federated Metals/IN0144.108

Site Location Hammond, Indiana  Drilling Started 6/14/95 9:50am  DrillingCompleted 6-14-95 2:00pm

Total Depth Drilled 30 feet  Hole Diameter 8 inches  Type of Sample/Coring Device 2'x2" Split Spoon Sampler

Land Surface Elevation 585.23 feet X Surveyed ____ Estimated  Sample Interval Continuous

Drilling Fluid Used Add 40 gallons potable water due to sand heave in augers  Drilling Method 4 1/4 I.D. HSA

Drilling Contractor Top Flight Drilling  Driller Doug White  Helper Chris Helphen

Logged by Jamie Yater, Geraghty & Miller, Inc.  Hammer Weight 140lb  Hammer Drop 30 inches

| GENERAL SAMPLE INFORMATION | | | | | | SAMPLE COLOR | | | | | SAMPLE TEXTURE | | | Moist-ure | NARRATIVE DESCRIPTION | USDA Textural Classification |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Depth (ft) to Contacts | | | | Mottles | | | | | Coarse Frag % | | | | |
| Number and Type | Sample Interval (ft) | Length Rcvrd (ft) | Upper | Lower | Blow Counts | Martix Color | Color | Abun-dance | Size | Con-trast | Fine Fraction | Granular | Pebbles | | Sorting roundness; pedologic/sedinrentary structure; coatings/stains; concentrations/accumulations; HCl Rxn; consistenency; cementation; engineering description, if applicable; contact thickness; other sample information; pH or other soil tests, if applicable. | |
| 1/SS | 4-6 | 0.5 | 4 | 6 | 4,6, 7,10 | | | | | | No recovery - large rock in shoe - some (6") Bentonite | | | | | |
| 2/SS | 6-8 | 1.3 | 6 | 8 | 3,5, 6,7 | 10YR 5/2 Grayish Brown | | | | | 10% silt 70% f-m sand | 10 | 10 | W | Mod sorted, round to subangular, mostly qtz sand, m-dense, few shell frags, slight Rxn, crumblike, pH=7.26 | Gravelly sand |
| 3/SS | 8-10 | 1.5 | 8 | 10 | 4,6, 9,8 | Same | | | | | Same | | | W | Same as above except sand is f-c, mod sorted | |
| 4/SS | 10-12 | 1 | 10 | 12 | 3,7, 10,11 | Same | | | | | Same | | | W | Same as above, slight Rxn, few roots, pH=7.10 | |
| 5/SS | 12-14 | 1 | 12 | 14 | 4,10, 18,27 | Same | | | | | 20% silt 80% v.f.sand | | | W | Well sorted, round to subangular sand, 90% qtz, m.dense, crumblike, strong Rxn, pH=7.19 | Loamy sand |
| 6/SS | 14-16 | 1.5 | 14 | 16 | 8,7, 10.13 | 10YR 5/1 Gray | | | | | Same | | | W | Same as above | |
| 7/SS | 16-18 | 1.5 | 16 | 18 | 8,8, 10,13 | Same | | | | | Same | | | W | Same as above, v.strong Rxn | |
| 8/SS | 18-20 | 2 | 18 | 20 | 6,8, 11,12 | Same | | | | | Same | | | W | Same as above, pH=-7.10, strong Rxn | |
| 9/SS | 20-22 | 0.3 | 20 | 22 | 3,5, 9,10 | Same | | | | | 40% silt 60% v.f.sand | | | W | Well sorted as above, m.dense, weak subangular, blocky, strong Rxn, pH=7.20 | Sandy loam |
| 10/SS | 22-24 | 1 | 22 | 24 | 4,5, 7,10 | Same | | | | | Same | | | W | Same as above | |
| 11/SS | 24-26 | 1 | 24 | 26 | 2,4, 6,7 | Same | | | | | Same | | | W | Same as above with little black org. matter throughout. Also many shell frags (white, calcareous), mostly sand size. | |

# SOIL BORING LOG



Well # MW-7D | Project/# Federated Metals/IN0144.108

Site Location: Hammond, Indiana | Drilling Started: 6-6-95 7:40am | DrillingCompleted: 6-6-95 12:15pm

Total Depth Drilled: 28 feet | Hole Diameter: 8 inches | Type of Sample/Coring Device: 2'x2" Split Spoon Sampler

Land Surface Elevation: 584.64 feet | X Surveyed | Estimated | Sample Interval: Continuous

Drilling Fluid Used: Add 10 gallons potable water due to sand heave in augers | Drilling Method: 4 1/4 I.D. HSA

Drilling Contractor: Top Flight Drilling | Driller: Doug White | Helper: Chris Helphen

Logged by: Jamie Yater, Geraghty & Miller, Inc. | Hammer Weight: 140lb | Hammer Drop: 30 inches

| GENERAL SAMPLE INFORMATION | | | | | | SAMPLE COLOR | | | | | SAMPLE TEXTURE | | | Moist-ure | NARRATIVE DESCRIPTION | USDA Textural Classifica-tion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Depth (ft) to Contacts | | | | Mottles | | | | | Coarse Frag % | | | | |
| Number and Type | Sample Interval (ft) | Length Rcvrd (ft) | Upper | Lower | Blow Counts | Martix Color | Color | Abun-dance | Size | Con-trast | Fine Fraction | Granular | Pebbles | | Sorting roundness; pedologic/sedinrentary structure; coatings/stains; concentrations/accumulations; HCl Rxn; consistenency; cementation; engineering description, if applicable; contact thickness; other sample information; pH or other soil tests, if applicable. | |
| 1/SS | 0-2 | 1.5 | 0 | 1 | 2,4, 6,11 | Black | | | | | | 20 | 80 | D | Slag frags, angular, black, loose | Gravel |
| | | | 1 | 1.7 | | 10yr 3/2 v.dark grayish brown | | | | | 30% silt 60% f-c sand | 10 | | M | Poorly to mod sorted w/depth, angular to subround qtz sand, mixed with slag frags, granular, | Sandy loam |
| | | | | | | | | | | | | | | | granular, loose, strong Rxn, approx 50% qtz sand (f-m grained), 50% slag frags, abrupt bndries | |
| | | | 1.7 | 2 | | Same | | | | | 20% f-sand 80% ? silt | | | M | M.dense, friable, crumblike, strong HCl Rxn, sand is mostly qtz | Silt |
| 2/SS | 2-4 | 1.7 | 2 | 2.3 | 7,2, 2,2 | Same | | | | | Same | | | M | Same as above, few slag frags | |
| | | | 2.3 | 3 | | Same | | | | | 40% f-m sand 60% silt | | | W | Roots common, no slag frags, strong Rxn | Silt loam |
| 3/SS | 4-6 | 0.7 | 4 | 6 | 4,2, 4,4 | 10YR 4/2 Dk grayish brown | | | | | 20% silt 80% f-m sand | | | W | Well sorted, mostly subround to subangular qtz sand (10% other), roots and black | Loamy sand |
| | | | | | | | | | | | | | | | organic material common, loose pH=7.45, crumblike, slight Rxn | |
| 4/SS | 6-8 | 2 | 6 | 8 | 4,4, 4,7 | 10YR 5/2 grayish brown | | | | | 20% silt 80% f-sand | | | W | Well sorted, subround to subangular, 90% qtz sand, crumblike, loose | |
| | | | | | | | | | | | | | | | m.dense, slight HCl Rxn, few roots | |
| 5/SS | 8-10 | 2 | 8 | 10 | 4,2, 5,11 | 10YR 4/1 gray | | | | | 20% silt 75% f-c sand | 5 | | W | Poorly sorted, subangular to subround, sand is mostly qtz (80%), many shell frags, strong Rxn, | |
| | | | | | | | | | | | | | | | crumblike, m.dense, pH=7.20 | |
| 6/SS | 10-12 | 1 | 10 | 12 | 7,7, 12,15 | 10YR 5/2 grayish brown | | | | | Same as 6-8' | | | W | Strong Rxn, Same as 6-8' but no roots | |
| 7/SS | 12-14 | 1.5 | 2 | 14 | 10,16 20,23 | 10YR 5/1 gray | | | | | Same | | | W | Same as above, pH=7.53, strong Rxn | |

# SOIL BORING LOG



Well # MW-8D | Project/# Federated Metals/IN0144.108

Site Location: Hammond, Indiana | Drilling Started: 6/7/95 10:00 | DrillingCompleted: 6-7-95 4:00pm

Total Depth Drilled: 28 feet | Hole Diameter: 8 inches | Type of Sample/Coring Device: 2'x2" Split Spoon Sampler

Land Surface Elevation: 584.31 feet | X Surveyed | Estimated | Sample Interval: Continuous

Drilling Fluid Used: Add 35 gallons potable water due to sand heave in augers | Drilling Method: 4 1/4 I.D. HSA

Drilling Contractor: Top Flight Drilling | Driller: Doug White | Helper: Chris Helphen

Logged by: Jamie Yater, Geraghty & Miller, Inc. | Hammer Weight: 140lb | Hammer Drop: 30 inches

| ENERAL SAMPLE INFORMATIO | | | | | | SAMPLE COLOR | | | | | SAMPLE TEXTURE | | | Moist-ure | NARRATIVE DESCRIPTION | USDA Textural Classifica-tion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Depth (ft) to Contacts | | | | Mottles | | | | | Coarse Frag % | | | Sorting roundness; pedologic/sedinrentary structure; coatings/stains; concentrations/accumulations; HCl Rxn; consistenency; cementation; engineering description, if applicable; contact thickness; other sample information; pH or other soil tests, if applicable. | |
| Number and Type | Sample Interval (ft) | Length Rcvrd (ft) | Upper | Lower | Blow Counts | Martix Color | Color | Abun-dance | Size | Con-trast | Fine Fraction | Granular | Pebbles | | | |
| 1/SS | 0-2 | 1.3 | 0 | 2 | 3,8, 27,20 | 10YR 4/2 dark grayish brown 6/1 gray | | | | | 60% f-c sand | 30 | 10 | M | Slag fill with little qtz sand, poorly sorted, black glassy and gray pumice like slag, angular, loose, granular | Gravely sand fill |
| 2/SS | 2-4 | 1.3 | 2 | 3.8 | 11,10, 9.17 | 10YR 2/1 v,dark gray | | | | | 40% silt 50% f-c sand | 10 | | M | Poorly sorted, slag, (angular, 60%) and qtz sand (subangular, 40%), m-dense, granular to crumblike w/depth, strong HCl Rxn | Sandy loam |
| | | | 3.8 | 4 | | 10YR 5/1 gray | | | | | 20% silt 80% f-m sand | | | W | Well sorted, 80% qtz sand, subround to subangular, m-dense crumblike, wet, slight HCl Rxn, abrupt bndy w/above | Loamy sand |
| 3/SS | 4-6 | 1 | 4 | 6 | 9,10, 14,13 | 10YR 5/2 grayish brown | | | | | 20% silt 80% f-c sand | | | W | Mod sorted sand as above, mostly f-m grained, many white shell frags throughout, strong Rxn, pH=7.50 | |
| 4/SS | 6-8 | 1.4 | 6 | 8 | 7,3, 11,18 | 10YR 5/2 grayish brown | | | | | 20% silt 70% f-c sand | 5 | 5 | W | Sand as above except coarse sand seam at 7.3', 1" thick abrupt bndries,only few white shell frags, slight Rxn | |
| 5/SS | 8-10 | 1 | 8 | 10 | 6,10, 17,21 | Same | | | | | Same | | | W | Same as above, no coarse seam, pH=8.23 | |
| 6/SS | 10-12 | 1 | 10 | 12 | 6,9, 14,14 | Same | | | | | 20% silt 80% f-m sand | | | W | Well sorted, mostly f-grained, round to subangular, crumblike, m-dense, 90% qtz sand, violent Rxn | |
| 7/SS | 12-14 | 1.5 | 12 | 14 | 6,10, 12,14 | Same | | | | | Same | | | W | V.well sorted sand as above, pH=8.66, violent HCl Rxn | |
| 8/SS | 14-16 | 1.5 | 4 | 16 | 9,7, 10,13 | Same | | | | | Same | | | W | Same as above | |

# SOIL BORING LOG



Well # MW-9D  Project/# Federated Metals/IN0144.108

Site Location Hammond, Indiana  Drilling Started 5-31-95 9:00am  DrillingCompleted 5-31-95 4:00pm

Total Depth Drilled 28.5 feet  Hole Diameter 8 inches  Type of Sample/Coring Device 2'x2" Split Spoon Sampler

Land Surface Elevation 583.27 feet X Surveyed ___ Estimated  Sample Interval Continuous

Drilling Fluid Used Add 40 gallons potable water due to sand heave in augers  Drilling Method 4 1/4 I.D. HSA

Drilling Contractor Top Flight Drilling  Driller Doug White  Helper Chris Helphen

Logged by Jamie Yater, Geraghty & Miller, Inc.  Hammer Weight 140lb  Hammer Drop 30 inches

| GENERAL SAMPLE INFORMATION | | | | | | SAMPLE COLOR | | | | | SAMPLE TEXTURE | | | Moist-ure | NARRATIVE DESCRIPTION | USDA Textural Classifica-tion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Depth (ft) to Contacts | | | | Mottles | | | | | Coarse Frag % | | | Sorting roundness; pedologic/sedinrentary structure; coatings/stains; concentrations/accumulations; HCl Rxn; consistenency; cementation; engineering description, if applicable; contact thickness; other sample information; pH or other soil tests, if applicable. | |
| Number and Type | Sample Interval (ft) | Length Rcvrd (ft) | Upper | Lower | Blow Counts | Martix Color | Color | Abun-dance | Size | Con-trast | Fine Fraction | Granular | Pebbles | | | |
| | 0-4" | | | | | | | | | | | | | | Asphalt | |
| 1/SS | 0.5-2.5 | 2 | 0.5 | 1.0 | 3,8, 9,6 | 10YR 5/1 gray 4/2 olive gray | | | | | 20% silt, 40% f-c sand | 20 | 20 | M | Poorly sorted, subround to angular, pebble size are l.s.frags, violent Rxn, cohesive, m.dense | Gravelly, loamy sand |
| | | | 1.0 | 2.0 | | Same | | | | | 20% silt, 40% f-c sand | 20 | 20 | M | Same as above, but no l.s. frags, strong Rxn, diffuse bndry w/above | |
| | | | 2.0 | 2.5 | | 2.5Y 2.5/1 black | | | | | 30% silt, 70% f sand | | | M | Well sorted, sand is mostly qtz (90%), few roots, no Rxn, m.dense abrupt bndry w/above | Loamy sand |
| | | | | | | | | | | | | | | | | |
| 2/SS | 2.5-4.5 | 1.3 | 2.5 | 4.2 | 7,5, 10,10 | 10YR 4/1 3/1 gray, dark gray | | | | | 20% silt 80% f-m sand | | | W | Mod well sorted, mostly fine, 90% qtz sand, color is in ~2" horiz.lamina, pH=11.09, slight Rxn, few roots | |
| | | | 4.2 | 4.5 | | Same | | | | | 20% silt, 80% f-c sand | | | W | Bndry is clear w/above, sand is porly sorted, f-c grained only ~50% qtz, 20% feldspons, 20% other-some calcareous, general slight Rxn, m,dense to loose, crumblike | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| 3/SS | 4.5-6.5 | 2 | 4.5 | 6.5 | 4,4, 8,10 | 10YR 5/2 grayish brown | | | | | 20% silt, 70% f-c sand | 10 | | W | Mod well sorted, mostly f-m grained, small gravel is subround, sand is subang to subround mineralogy as above, pH=8.97, 4.2' to 4.5', slight Rxn, white shell frags, (sand size) common | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| 4/SS | 6.5-8.5 | 1.3 | 6.5 | 8.5 | 7,8, 13,13 | 2.5Y 5/2 grayish brown | | | | | 20% silt, 65% f-c sand | 10 | 5 | W | Same as above except few pebble size gravel, also-fines downward, fine sand is mostly qtz round to subround, otherwise as above, slight Rxn, except shell frags (sand size) and some l.s. gravel, violent Rxn, crumblike | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| 5/SS | 8.5-10.5 | 2 | 8.5 | 10.5 | 10,5, 8,12 | 2.5Y 5/2 grayish brown | | | | | Same | 10 | 5 | W | Same as above, pH=8.35 | |
| | | | | | | | | | | | | | | | | |
| 6/SS | 10.5-12.5 | 2 | 10.5 | 12.5 | 13,14, 20,23 | 2.5Y 5/2 grayish brown | | | | | 10% silt, 80% f,sand | 5 | 5 | W | Well sorted, sand is 90% qtz, round to subround, m.dense, crumblike, few small subround gravel, strong HCl Rxn, few shell frags, sand size | |
| | | | | | | | | | | | | | | | | |

# SOIL BORING LOG



Well # MW-10D  Project/# Federated Metals/IN0144.108

Site Location Hammond, Indiana  Drilling Started 6-5-95 9:15am  DrillingCompleted 6-5-95 2:45pm

Total Depth Drilled 28 feet  Hole Diameter 8 inches  Type of Sample/Coring Device 2'x2" Split Spoon Sampler

Land Surface Elevation 584.18 feet X Surveyed ___ Estimated  Sample Interval Continuous

Drilling Fluid Used Add 40 gallons potable water due to sand heave in augers  Drilling Method 4 1/4 I.D. HSA

Drilling Contractor Top Flight Drilling  Driller Doug White  Helper Chris Helphen

Logged by Jamie Yater, Geraghty & Miller, Inc.  Hammer Weight 140lb  Hammer Drop 30 inches

| GENERAL SAMPLE INFORMATION | | | | | | SAMPLE COLOR | | | | | SAMPLE TEXTURE | | | Moist-ure | NARRATIVE DESCRIPTION | USDA Textural Classifica-tion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Depth (ft) to Contacts | | | | Mottles | | | | | Coarse Frag % | | | | |
| Number and Type | Sample Interval (ft) | Length Rcvrd (ft) | Upper | Lower | Blow Counts | Martix Color | Color | Abun-dance | Size | Con-trast | Fine Fraction | Granular | Pebbles | | Sorting roundness; pedologic/sedinrentary structure; coatings/stains; concentrations/accumulations; HCl Rxn; consistenency; cementation; engineering description, if applicable; contact thickness; other sample information; pH or other soil tests, if applicable. | |
| 1/SS | 0-2 | 1.5 | 0 | 1.5 | 1,2, 3,2 | 10YR 5/4 yellowish brown 2/1 black | | | | | 10% silt, 40% f-c sand | 45 | 5 | M | Poorly sorted, fine sand is round to subround qtz, m-c.sand are glassy black, slag frags, angular, loose, no Rxn, abrupt contact w/below, granular | Gravelly sand |
| | | | 1.5 | 2 | | 10YR 5/3 brown&black | | | | | 10% silt, 70% f-m sand | 20 | | M | Mod sorted, subangular to subround, 80% qtz sand, granules are glassy black | |
| | | | | | | | | | | | | | | | Slag frags, angular, loose, no Rxn, crumblike | |
| 2/SS | 2-4 | 1.0 | 2 | 4 | 3,2, 2.2 | Black | | | | | 10% c.sand (size) | 90 | | W | Angular black glassey slag, loose, abundant roots, frags are well sorted. mostly 2-4mm, no qtz sand-only slag, no Rxn, wet | Gravel |
| 3/SS | 4-6 | 1.5 | 4 | 5 | 2,4, 4,7 | Black | | | | | Same | | | | Same as above | |
| | | | 5 | 6 | | 10YR 5/3 brown | | | | | 10% silt 70% f-c.sand | 20 | | W | Abrupt bndry w/above, poorly sorted, subround to subangular, m-dense, crumblike, few roots and blk wood frags, no Rxn, sand is ~60% qtz, 40% others | Gravelly sand |
| 4/SS | 6-8 | 0.8 | 6 | 8 | 5,5, 7,11 | 10YR 5/1 gray | | | | | 10% silt 80% f-c.sand | 10 | | W | Mod sorted, mostly f.grained, 80% qtz, round to subangular, m.dense, crumblike, slight Rxn | Loamy sand |
| 5/SS | 8-10 | 0.8 | 8 | 10 | 4,6, 7,10 | Same | | | | | Same | 10 | | W | Same as above excapt few white shell frags, slight Rxn | |
| 6/SS | 10-12 | 1.0 | 10 | 12 | 3,4, 11,15 | Gray | | | | | Same | 10 | | W | Same as above, slight Rxn | |
| 7/SS | 12-14 | 0.5 | 12 | 14 | 5,2, 9,12 | 10YR 5/2 grayish brown | | | | | 20% silt 80% v.f.sand | | | W | Well sorted, subangular to round, 80% qtz sand, 10% feldspars, 10% other, crumblike, m.dense, few white shell frags, strong Rxn | |

# SOIL BORING LOG



Well # MW-11D  Project/# Federated Metals/IN0144.108

Site Location Hammond, Indiana  Drilling Started 6-1-95 8:00am  DrillingCompleted 6-1-95 1:45pm

Total Depth Drilled 28 feet  Hole Diameter 8 inches  Type of Sample/Coring Device 2'x2" Split Spoon Sampler

Land Surface Elevation 582.77 feet X Surveyed ___ Estimated  Sample Interval Continuous

Drilling Fluid Used Add 40 gallons potable water due to sand heave in augers  Drilling Method 4 1/4 I.D. HSA

Drilling Contractor Top Flight Drilling  Driller Doug White  Helper Chris Helphen

Logged by Jamie Yater, Geraghty & Miller, Inc.  Hammer Weight 140lb  Hammer Drop 30 inches

| GENERAL SAMPLE INFORMATION | | | | | | SAMPLE COLOR | | | | | SAMPLE TEXTURE | | | Moist-ure | NARRATIVE DESCRIPTION | USDA Textural Classifica-tion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Depth (ft) to Contacts | | | | Mottles | | | | | Coarse Frag % | | | | |
| Number and Type | Sample Interval (ft) | Length Rcvrd (ft) | Upper | Lower | Blow Counts | Martix Color | Color | Abun-dance | Size | Con-trast | Fine Fraction | Granular | Pebbles | | Sorting roundness; pedologic/sedinrentary structure; coatings/stains; concentrations/accumulations; HCl Rxn; consistenency; cementation; engineering description, if applicable; contact thickness; other sample information; pH or other soil tests, if applicable. | |
| 1/SS | 0-2 | 1 | 1 | 1.2 | 3,3, 2,4 | N 4/8 gray | | | | | 20% f-c and size 80% silt size | | | M | Looks like baghouse dust, powdery, cohesive, few slag frags, blk, & few lg l.s. frags from surface gravel | Silty loam |
| | | | 1.2 | 2 | | 10YR 3/2 v.dk grayish brn | | | | | 20% silt 60% f.sand | 10 | 10 | M | Sand is mostly qtz, (some blk and brn coarse sand size slag frags), well sorted, subangular to subround, mxed with slag and limestone frags, loose, crumblike to granular, abrupt bndry w/above, no Rxn to slight Rxn (except on l.s.) | Gravelly sandy loam |
| 2/SS | 2-4 | 1.5 | 2.5 | 4 | 10,5, 7,9 | 10YR 5/2 grayish brn | | | | | 20% silt 70% f.sand | 10 | | W | Sand is well sorted, round to subround, 90% qtz, m.dense, crumblike, gravel is subround to subangular, pH=8.95, sight Rxn, few white shell frags (contact w/above not available) | Loamy sand |
| 3/SS | 4-6 | 2 | 4 | 5.5 | 5,6, 9,8 | 7.5YR 5/2 brown | | | | | 20% silt 50% f-c.samd | 20 | 10 | W | Sand is mod sorted, subround to subangular as above, gravel as above, some 7.5YR 4/4 brown stain from 5-5.5, also sheen on soil, slight Rxn | Gravelly sandy loam |
| | | | 5.5 | 5.8 | | Same | | | | | 40% m-c.sand | 50 | 10 | W | Poorly sorted, subround to angular, fragmented rock, only 50% qtz, 50% other, also 7.5 YR 3/2 dk brown product w/slight hydrocarbon odor, sheen throughout sample. | Sandy gravel |
| | | | 5.8 | 6 | | 10YR 5/2 grayish brn | | | | | 20% silt 70% f.sand | 10 | | W | Same as 2.5-4, abrupt bndry w/ above | Loamy sand |
| 4/SS | 6-8 | 2 | 6 | 6.5 | 7,7, 12,13 | Same | | | | | Same | | | W | Same as above | |
| | | | 6.5 | 7.5 | | Same | | | | | 40% f-m.sand 10% silt | 25 | 25 | W | Poorly sorted, m.dense, crumblike, only 50% qtz | Sandy gravel |
| | | | 7.5 | 8 | | Same | | | | | 20% silt 70% f-m.sand | 10 | | W | Same as 6-6.5', slight Rxn, pH=8.18, also white shell frags (sand size common) | Loamy sand |
| 5/SS | 8-10 | 2 | 8 | 8.5 | 10,5, 7,7 | Same | | | | | 20% silt 70% f-m.sand | 10 | | W | Sand is mod well sorted, approx 90% qtz, subround to subangular, m.dense, crumblike, slight Rxn, white shell frags common | |

# SOIL BORING LOG



Well # MW-11D  Project/# Federated Metals/IN0144.108

Site Location Hammond, Indiana  Drilling Started 6-1-95 8:00am  DrillingCompleted 6-1-95 1:45pm

Total Depth Drilled 28 feet  Hole Diameter 8 inches  Type of Sample/Coring Device 2'x2" Split Spoon Sampler

Land Surface Elevation 582.77 feet X Surveyed ___ Estimated  Sample Interval Continuous

Drilling Fluid Used Add 40 gallons potable water due to sand heave in augers  Drilling Method 4 1/4 I.D. HSA

Drilling Contractor Top Flight Drilling  Driller Doug White  Helper Chris Helphen

Logged by Jamie Yater, Geraghty & Miller, Inc.  Hammer Weight 140lb  Hammer Drop 30 inches

| GENERAL SAMPLE INFORMATION | | | | | | SAMPLE COLOR | | | | | SAMPLE TEXTURE | | | Moist-ure | NARRATIVE DESCRIPTION | USDA Textural Classifica-tion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Depth (ft) to Contacts | | | | Mottles | | | | | Coarse Frag % | | | | |
| Number and Type | Sample Interval (ft) | Length Rcvrd (ft) | Upper | Lower | Blow Counts | Martix Color | Color | Abun-dance | Size | Con-trast | Fine Fraction | Granular | Pebbles | | Sorting roundness; pedologic/sedinrentary structure; coatings/stains; concentrations/accumulations; HCl Rxn; consistenency; cementation; engineering description, if applicable; contact thickness; other sample information; pH or other soil tests, if applicable. | |
| 13/SS | 24-26 | 2 | 24 | 26 | 10,6, 9,13 | Same | | | | | 40% silt 50% v.f.sand | 5 | 5 | W | Same as above but few angular gravel throughout, violent Rxn | Sandy loam |
| | | | | | | | | | | | | | | | | |
| 14/SS | 26-28 | 2 | 26 | 27.5 | 9,2, 3,4 | Same | | | | | Same | | | W | Same as above, shells & frags common | |
| | | | 27.5 | 28 | | | | | | | 5% f-c.sand 15% silt 80% clay | | | W | Abrupt bndry w/above, very plastic, soft, strong Rxn, pH=7.93 | Clay |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | E.O.B. at 28' | | | | | |
| | | | | | | | | | | | | | | | | |

# SOIL BORING LOG



Well # MW-12D  Project/# Federated Metals/IN0144.108

Site Location Hammond, Indiana  Drilling Started 6-2-95 8:15am  DrillingCompleted 6-2-95 2:45pm

Total Depth Drilled 27 feet  Hole Diameter 8 inches  Type of Sample/Coring Device 2'x2" Split Spoon Sampler

Land Surface Elevation 583.00 feet X Surveyed ___ Estimated  Sample Interval Continuous

Drilling Fluid Used Add 40 gallons potable water due to sand heave in augers  Drilling Method 4 1/4 I.D. HSA

Drilling Contractor Top Flight Drilling  Driller Doug White  Helper Chris Helphen

Logged by Jamie Yater, Geraghty & Miller, Inc.  Hammer Weight 140lb  Hammer Drop 30 inches

| GENERAL SAMPLE INFORMATION | | | | | | SAMPLE COLOR | | | | | SAMPLE TEXTURE | | | Moist-ure | NARRATIVE DESCRIPTION | USDA Textural Classifica-tion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Depth (ft) to Contacts | | | | Mottles | | | | | Coarse Frag % | | | | |
| Number and Type | Sample Interval (ft) | Length Rcvrd (ft) | Upper | Lower | Blow Counts | Martix Color | Color | Abun-dance | Size | Con-trast | Fine Fraction | Granular | Pebbles | | Sorting roundness; pedologic/sedinrentary structure; coatings/stains; concentrations/accumulations; HCl Rxn; consistenency; cementation; engineering description, if applicable; contact thickness; other sample information; pH or other soil tests, if applicable. | |
| 9/SS | 17-19 | 2 | 17 | 19 | 4,8, 13,14 | Same | | | | | 30% silt 70% v.f.sand | | | W | Same as above | Loamy sand |
| | | | | | | | | | | | | | | | | |
| 10/SS | 19-21 | 2 | 19 | 21 | 9,5, 9,11 | Same | | | | | Same | | | W | Same as above, checked pH meter with calibration standard, not working correctly | |
| | | | | | | | | | | | | | | | | |
| 11/SS | 21-23 | 2 | 21 | 23 | 4,5, 9,10 | Same | | | | | 40% silt 60% v.f.sand | | | W | V.well sorted sand, as above, weak subangular blocky, m.dense, violent HCl Rxn | Sandy loam |
| | | | | | | | | | | | | | | | | |
| 12/SS | 23-25 | 2 | 23 | 25 | 5,6, 8,10 | 10YR 5/1 gray | | | | | Same | | | W | Same as above | |
| | | | | | | | | | | | | | | | | |
| 13/SS | 25-27 | 2 | 25 | 26.5 | 2,2, 2,3 | Same | | | | | Same | | | W | Same as above | |
| | | | 26.5 | 27 | | 10YR 4/1 dark gray | | | | | 5% f-c.sand 15% silt 80% clay | | | | V.plastic, soft, strong Rxn, abrupt bndry w/above | Clay |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | E.O.B. at 27' | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |

# SOIL BORING LOG



Well # MW-13D | Project/# Federated Metals/IN0144.108

Site Location: Hammond, Indiana | Drilling Started: 5-30-95 2:00pm | DrillingCompleted: 5-30-95 5:15pm

Total Depth Drilled: 28.5 feet | Hole Diameter: 8 inches | Type of Sample/Coring Device: 2'x2" Split Spoon Sampler

Land Surface Elevation: 583.01 feet | X Surveyed | Estimated | Sample Interval: Continuous

Drilling Fluid Used: Add 40 gallons potable water due to sand heave in augers | Drilling Method: 4 1/4 I.D. HSA

Drilling Contractor: Top Flight Drilling | Driller: Doug White | Helper: Chris Helphen

Logged by: Jamie Yater, Geraghty & Miller, Inc. | Hammer Weight: 140lb | Hammer Drop: 30 inches

| GENERAL SAMPLE INFORMATION | | | | | | SAMPLE COLOR | | | | | SAMPLE TEXTURE | | | Moist-ure | NARRATIVE DESCRIPTION | USDA Textural Classifica-tion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Depth (ft) to Contacts | | | | Mottles | | | | | Coarse Frag % | | | | |
| Number and Type | Sample Interval (ft) | Length Rcvrd (ft) | Upper | Lower | Blow Counts | Martix Color | Color | Abun-dance | Size | Con-trast | Fine Fraction | Granular | Pebbles | | Sorting roundness; pedologic/sedinrentary structure; coatings/stains; concentrations/accumulations; HCl Rxn; consistenency; cementation; engineering description, if applicable; contact thickness; other sample information; pH or other soil tests, if applicable. | |
| 8/SS | 14.5-16.5 | 1.3 | 14.5 | 16.5 | 4,7, 9,13 | Same | | | | | 20% 75% v-f.sand | 5 | | W | Same as above but w/5% 2-4 mm subround gravel throughout | Loamy sand |
| | | | | | | | | | | | | | | | | |
| 9/SS | 16.5-18.5 | 1.7 | 16.5 | 18.5 | 6,4, 8,10 | Same | | | | | Same | 5 | | W | pH=7.97, strong Rxn, few small (sand size) white shell frags throughout | |
| | | | | | | | | | | | | | | | | |
| 10/SS | 18.5-20.5 | 1.7 | 18.5 | 20.5 | 8,5, 9,9 | Same | | | | | Same | 5 | | W | Same as above | |
| Driller accidently drilled through the 20.5 to 22.5 depth interval | | | | | | | | | | | | | | | | |
| 11/SS | 22.5-24.5 | 2 | 22.5 | 24.5 | 7,4, 7,9 | Same | | | | | 40% silt 50% v-f.sand | 10 | | W | M.dense, weak, subangular blocky sand as above, strong Rxn, gravel is 2'-4mm subround, pH=7.97 | Sandy loam |
| | | | | | | | | | | | | | | | | |
| 12/SS | 24.5-26. | 1.7 | 24.5 | 26.5 | 5,4, 6,3 | Same | | | | | 40% silt 50% f-c.sand | 10 | | W | Mod sorted, mostly fine qtz sand as above, subangular to sub round, m.dense | |
| | | | | | | | | | | | | | | | | |
| 13/SS | 26.5-28.5 | 2 | 26.5 | 27.7 | 2,2, 3,5 | Same | | | | | Same | | | W | Same as above, strong Rxn | |
| | | | 27.7 | 28.5 | | 10YR 4/1 dk gray | | | | | 5% f-c.sand 15% silt 80% clay | | | W | V.plastic, soft, clear bndry w/above, pH=7.76, strong Rxn | Clay |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | E.O.B. at 28.5' | | | | | |
| | | | | | | | | | | | | | | | | |

# SOIL BORING LOG

Well # MW-14D  Project/# Federated Metals IN0144.108  Page 2 of 2

Site Location Hammond, Indiana  Drilling Started 8:45am 11/17/95  DrillingCompleted 10:30am 11/17/95

Total Depth Drilled 26 feet  Hole Diameter 8 inches  Type of Sample/Coring Device 2'x2" Split Spoon Sampler

Land Surface Elevation ____ feet ____ Surveyed ____ Estimated  Sample Interval Continuous

Drilling Fluid Used NA  Drilling Method 4 1/4 I.D. HSA

Drilling Contractor Top Flight Drilling  Driller Jeff  Helper Dave Chickoraki

Logged by Jamie Yater, Geraghty & Miller, Inc.  Hammer Weight 140 LB.  Hammer Drop 30 inches

| GENERAL SAMPLE INFORMATION | | | | | | SAMPLE COLOR | | | | | SAMPLE TEXTURE | | | Moist-ure | NARRATIVE DESCRIPTION | USDA Textural Classifica-tion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Depth (ft) to Contacts | | | | Mottles | | | | | Coarse Frag % | | | Sorting roundness; pedologic/sedinrentary structure; coatings/stains; concentrations/accumulations; HCl Rxn; consistenency; cementation; engineering description, if applicable; contact thickness; other sample information; pH or other soil tests, if applicable. | |
| Sample Interval | Number and Type | Length Received (ft) | Upper | Lower | Blow Counts | Martix Color | Color | Abun-dance | Size | Con-trast | Fine Fraction | Granular | Pebbles | | | |
| 16-18 | 8/SS | 1.5 | 16 | 18 | 6,9<br>11,16 | same | | | | | 20% silt<br>80% f. sand | | | W | V. well sorted, round to subround qtz sand, m.dense, crumblike to weak subangular blocky, | Loamy |
| | | | | | | | | | | | | | | | pH = 8.02 ,slight HCl Rxn | Sand |
| | | | | | | | | | | | | | | | | |
| 18-20 | 9/SS | 2.0 | 18 | 20 | 8,6<br>9,8 | same | | | | | same | | | W | Same as above, except v. few (<3%) small subround gravel | |
| | | | | | | | | | | | | | | | | |
| 20-22 | 10/SS | 1.5 | 20 | 22 | 4,6<br>9,8 | same | | | | | same | | | W | Same as above except strong HCl Rxn, few white calcareous shell frags (sand size) pH = 8.18 | |
| | | | | | | | | | | | | | | | | |
| 22-24 | 11/SS | 2.0 | 22 | 24 | 3,5<br>5,7 | same | | | | | 30% silt<br>70% f. sand | | | W | Silt increase, same as above, strong HCl Rxn, weak subangular blocky | Sandy Loam |
| | | | | | | | | | | | | | | | | |
| 24-26 | 12/SS | 2.0 | 24 | 25.5 | 5,3<br>5,6 | same | | | | | same | | | W | Same as above, gravel concentrated at bndry with below (subround 2mm-1cm) | |
| | | | 25.5 | 26 | | 2.5Y 5/1<br>gray | | | | | 10% v.f. sand<br>15%silt<br>75% clay | | | | abrupt bndry w/above, highly plastic, m.soft, slight HCl Rxn, pH = 8.02 | Clay |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | Well set at 26' E.O.B. at 26' | |
| | | | | | | | | | | | | | | | | |
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# SOIL BORING LOG



Well # P-1D  Project/# Federated Metals/IN0144.108

Site Location Hammond, Indiana  Drilling Started 6-13-95 10:10am  DrillingCompleted 6-13-95 4:30pm

Total Depth Drilled 28 feet  Hole Diameter 8 inches  Type of Sample/Coring Device 2'x2" Split Spoon Sampler

Land Surface Elevation 582.96 feet X Surveyed ____ Estimated  Sample Interval Continuous

Drilling Fluid Used None  Drilling Method 4 1/4" I.D. HSA

Drilling Contractor Top Flight Drilling  Driller Doug White  Helper Chris Helphen

Logged by Jamie Yater, Geraghty & Miller, Inc.  Hammer Weight 140 lb  Hammer Drop ____ inches

| GENERAL SAMPLE INFORMATION | | | | | | SAMPLE COLOR | | | | | SAMPLE TEXTURE | | | Moist-ure | NARRATIVE DESCRIPTION | USDA Textural Classifica-tion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Depth (ft) to Contacts | | | | Mottles | | | | | Coarse Frag % | | | | |
| Number and Type | Sample Interval (ft) | Length Rcvrd (ft) | Upper | Lower | Blow Counts | Martix Color | Color | Abun-dance | Size | Con-trast | Fine Fraction | Granular | Pebbles | | Sorting roundness; pedologic/sedinrentary structure; coatings/stains; concentrations/accumulations; HCl Rxn; consistenency; cementation; engineering description, if applicable; contact thickness; other sample information; pH or other soil tests, if applicable. | |
| 12/SS | 22-24 | 1 | 22 | 24 | 16,5, 6,8 | Same | | | | | 40% silt 60% vf.sand | | | W | V.well sorted mostly qtz sand, round to subround, weak subangular blocky when broken, | Sandy loam |
| | | | | | | | | | | | | | | | m-dense, violent HCl Rxn | |
| 13/SS | 24-26 | 1.1 | 24 | 26 | 8,5, 4,2 | Same | | | | | Same | | | W | Same as above | |
| | | | | | | | | | | | | | | | | |
| 14/SS | 26-28 | 1.2 | 26 | 27 | 5,3, 4,2 | Same | | | | | Same | | | W | Same as above | |
| | | | 27 | 28 | | 10YR 5/1 gray | | | | | 10% f-c sand 10% silt, 80% clay | | | W | Soft, very plastic, abrupt bndry with above, strong HCl Rxn. | Clay |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | E.O.B. at 28' | | | | | | |
| | | | | | | | | | | | | | | | | |
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# SOIL BORING LOG

Well # MW-16D | Project/# Federated Metals/IN0144.108

Site Location: Hammond, Indiana | Drilling Started: 5/13/96 12:30pm | DrillingCompleted: 5/13/96 4:30pm

Total Depth Drilled: 26 feet | Hole Diameter: 8 inches | Type of Sample/Coring Device: 2'x2" Split Spoon Sampler

Land Surface Elevation: 582.18 feet | X Surveyed | Estimated | Sample Interval: Continuous

Drilling Fluid Used: None | Drilling Method: 4 1/4 I.D. HSA

Drilling Contractor: Top Flight | Driller: Dave Chickoracki | Helper: Brian

Logged by: Jamie Yater, Geraghty & Miller, Inc. | Hammer Weight: 30 | Hammer Drop: 30 inches

| GENERAL SAMPLE INFORMATION | | | | | | SAMPLE COLOR | | | | | SAMPLE TEXTURE | | | Moist-ure | NARRATIVE DESCRIPTION | USDA Textural Classifica-tion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Depth (ft) to Contacts | | | | Mottles | | | | | Coarse Frag % | | | | |
| Number and Type | Sample Interval (ft) | Length Rcvrd (ft) | Upper | Lower | Blow Counts | Martix Color | Color | Abun-dance | Size | Con-trast | Fine Fraction | Granular | Pebbles | | Sorting roundness; pedologic/sedinrentary structure; coatings/stains; concentrations/accumulations; HCl Rxn; consistenency; cementation; engineering description, if applicable; contact thickness; other sample information; pH or other soil tests, if applicable. | |
| 1/SS | 0-2 | 1.6 | 0 | 1 | 2,3, 3,6 | 10YR 3/2 very dark grayish brown | | | | | 10% clay, 30% f-c sand, 60% silt | | | M | Sand poorly sorted, subangular to subround, mostly quartz, cohesive but non-plastic, roots abundant. | Silty loam |
| | | | 1 | 2 | | 10YR 5/3 brown | | | | | 20% silt, 80% f-m sand | | | M | Sand mostly quartz, well sorted, few small gravel, round to subangular, loose, crumblike, no Rxn. | Loamy sand |
| 2/SS | 2-4 | 1.6 | 2 | 4 | 3,2, 4,4 | 10YR 5/6 yellowish brown | | | | | 20% silt, 80% f-m sand | | | W | Same as 1-2', except color, no Rxn, pH=6.80, few small white shell fragments. | |
| 3/SS | 4-6 | 1.2 | 4 | 6 | 2,3, 6,7 | 10YR 6/2 lt brnish gray | | | | | 20% silt, 80% f-m sand | | | W | Same as above, except medium-coarse sand concentrated in layers at 4.5, 4.8 and 5.2', seams are approximately 1" horizontal thickness. | |
| 4/SS | 6-8 | NR | 6 | 8 | 1,2, 3,7 | 10YR 6/3 pale brown | | | | | 20% silt, 80% f-m sand | | | W | Sand moderately well sorted, subangular to subround, mostly (90%) quartz, medium dense, crumblike, few white shell fragments, few small gravel. * pH reading low, try to recalibrate, will not calibrate | |
| 5/SS | 8-10 | NR | 8 | 10 | 3,2, 4,5 | 10YR 5/2 grayish brown | | | | | 20% silt, 80% f-m sand | | | W | Same as above, slight Rxn. | |
| 6/SS | 10-12 | 1.2 | 10 | 12 | 4,5, 7,11 | 10YR 5/2 grayish brown | | | | | 20% silt, 80% f-m sand | | | W | Same as above, slight Rxn. | |

# SOIL BORING LOG

Well # MW-17D  Project/# Federated Metals/IN0144.108

Site Location Hammond, Indiana  Drilling Started 5/14/96 9:30am  DrillingCompleted 5/14/96 12:00pm

Total Depth Drilled 26.5 feet  Hole Diameter 8 inches  Type of Sample/Coring Device 2'x2" Split Spoon Sampler

Land Surface Elevation 582.12 feet X Surveyed ___ Estimated  Sample Interval Continuous

Drilling Fluid Used Added 20 gallons potable water to prevent heaving sand.  Drilling Method 4 1/4 I.D. HSA

Drilling Contractor Top Flight  Driller Dave Chickoracki  Helper Brian

Logged by Jamie Yater, Geraghty & Miller, Inc.  Hammer Weight 30  Hammer Drop 30 inches

| GENERAL SAMPLE INFORMATION | | | | | | SAMPLE COLOR | | | | | SAMPLE TEXTURE | | | Moist-ure | NARRATIVE DESCRIPTION | USDA Textural Classifica-tion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Depth (ft) to Contacts | | | | Mottles | | | | | Coarse Frag % | | | | |
| Number and Type | Sample Interval (ft) | Length Rcvrd (ft) | Upper | Lower | Blow Counts | Martix Color | Color | Abun-dance | Size | Con-trast | Fine Fraction | Granular | Pebbles | | Sorting roundness; pedologic/sedinrentary structure; coatings/stains; concentrations/accumulations; HCl Rxn; consistenency; cementation; engineering description, if applicable; contact thickness; other sample information; pH or other soil tests, if applicable. | |
| 1/SS | 0-2 | 1.6 | 0 | 1 | 2,1, 2,2 | 10yr 4/2 dk grayish brn | | | | | 20% silt 60% f-m sand | | | M | Sand, subround to subangular, medium dense to loose, moderately well sorted, few small gravel roots abundant. | Sandy loam |
| | | | 1 | 2 | | 10yr 4/2 dk grayish brn | | | | | 20% silt 80% f-m sand | | | | Sand, mostly quartz, moderately well sorted, few roots, crumblike, cohesive, slight Rxn. | Loamy sand |
| 2/SS | 2-4 | 1.6 | 2 | 4 | 4,3, 4,4 | 10yr 4/2 dk grayish brn | | | | | 20% silt 80% f-m sand | | | W | Same as above, but few small subround gravel, WET at 2', only moderately sorted. | |
| 3/SS | 4-6 | 1.8 | 4 | 6 | 4,3, 4,7 | 10yr 4/2 dk grayish brn | | | | | 20% silt, 80% f-c sand | | | W | Sand, moderately sorted, few small gravel, sand is mostly fine-medium grained, subangular to subround, medium dense to loose, crumblike, few small roots, few white shell fragments, slight Rxn. | |
| 4/SS | 6-8 | 0.8 | 6 | 8 | 4,3, 2,3 | 10yr 4/2 dk grayish brn | | | | | 20% silt, 80% f-c sand | | | W | Same as above, slight Rxn. | |
| 5/SS | 8-10 | 1 | 8 | 10 | 4,2, 2,2 | 2.5YR 5/2 grayish brn | | | | | 20% silt, 80% f-c sand | | | W | Same as above, except less coarse grained sand, moderately well sorted. | |
| 6/SS | 10-12 | 1 | 10 | 12 | 3,7, 10,9 | 2.5YR 4/1 grayish brn | | | | | 20% silt, 80% f-m sand | | | W | Sand, moderately well sorted, no coarse grained, strong Rxn. | |
| 7/SS | 12-14 | 1 | 12 | 14 | 5,7, 10,9 | 2.5YR 4/1 grayish brn | | | | | 20% silt, 80% f-m sand | | | W | Same as above, white shell fragments (small), abundant, strong Rxn, sand is mostly fine grained. | |
| 8/SS | 14-16 | 1.6 | 14 | 16 | 3,3, 7,10 | 2.5YR 4/1 grayish brn | | | | | 20% silt, 80% f-m sand | | | W | Same as above, shell fragments abundant, whole shell ~1 cm at 15.8'. | |